Patient Handling, Workplace Violence, and Contact-Related Occupational Injury Among Residential Care Workers

A DISSERTATION
SUBMITTED TO THE FACULTY OF
THE UNIVERSITY OF MINNESOTA
BY

Adam Fred Moskowitz

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR DEGREE OF
DOCTOR OF PHILOSOPHY

Katherine E. Schofield, PhD, Advisor

May 2024

Acknowledgements

Many people gave generous amounts of time for the success of this project. Dr. Darin Erickson, Dr. Carolyn Porta, Dr. Marizen Ramirez, and Dr. Katie Schofield served as doctoral committee members. Andy Ryan, MS provided biostatistics consulting. Evelyn Doran, JD provided legal coding. Brian Zaidman, MS of the Minnesota Department of Labor and Industry provided data access and support. Dr. Christina Rosebush, Dr. Neal Wiggerman, Dr. Pat McGovern, Breca Tschida, CPE of MN OSHA, Jane Thomason of National Nurses United, Eric Jacobson of AFSCME Council 5, and Cecelia Capanna, RN provided subject area expertise and guidance.

This research received funding from the National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention, Department of Health and Human Services and the Midwest Center for Occupational Health and Safety (NIOSH Training Grant Number 5T42OH00843418).

Dedication

In memory of Daniel Moskowitz.

Abstract

Background

The Healthcare and Social Assistance industry, which employs over 21 million private sector workers in the United States, has some of the highest rates of occupational musculoskeletal disorders (MSDs) and injuries of the back or trunk out of any industry[1-3]. These injuries largely result from the physical strain and awkward postures associated with lifting, moving, or otherwise assisting patients with limited mobility[4]. Several states have attempted to regulate these hazardous job duties, known as Safe Patient Handling and Mobility (SPHM), yet many healthcare workers are employed in long-term and residential facilities that are excluded from these regulations[5].

Workplace violence (WPV) is another major cause of healthcare worker injury that arises from the uniquely intimate settings and job duties in direct care work, with over 70% of all non-fatal instances of WPV recorded in the US occurring among healthcare workers[6]. Like SPHM, WPV is especially pronounced among lower levels of healthcare worker certification and in long term or residential settings[7]. With the understanding that SPHM and WPV injuries are shaped by common factors, research is needed to analyze the gaps and areas for increased coverage in existing SPHM policy, compare injury reduction among workers that are covered by existing policy with those that are not, and characterize SPHM and WPV injury burdens in the overlooked long-term residential care sector.

Objective

This research aims to characterize the landscape of patient contact-related injury among the wider healthcare workforce in Minnesota, with a focus on workers at long-term residential disability facilities, also known as group homes. Results can inform holistic policy approaches to reducing SPHM and WPV injury, which are interrelated with the uniquely intimate tasks and responsibilities of healthcare workers.

Manuscript 1: *Aim:* Create a policy map of all state-level SPHM laws in the United States, noting their scopes of coverage and common elements. *Methods:* A legal assessment was used to collect and characterize all state-level SPHM policies according to a coding protocol. Two researchers coded all state laws for their scopes of coverage, legal requirements, and avenues for enforcement. *Results:* Between 2006 and 2023, eleven out of fifty states enacted SPHM policies to protect healthcare workers from injury. All state policies covered general hospitals, with policies favoring higher-acuity settings over lower-acuity settings. Common interventions included administrative controls such as SPHM committees, safety trainings, and hazard assessments. Required engineering controls such as purchasing SPHM equipment and modifying physical work spaces were less common.

Manuscript 2: *Aim:* Evaluate the 2007 Minnesota Safe Patient Handling Act's effectiveness in reducing SPHM injury, and investigate its effects on WPV injury, by comparing injury trends in workers covered by the policy with workers in control industries that were not covered by the policy. *Methods:* Negative binomial regression was used to calculate rates of SPHM and WPV injury from Minnesota's workers' compensation claims database, the US Census Bureau's Quarterly Workforce Indicators, and the US Bureau of Labor Statistics' Occupational Employment and Wage Statistics.

Baseline and follow-up rates were calculated to track the impact of the law over time. *Results:* Workers that were covered the Act experienced greater relative reductions of SPHM injury than workers that were not covered by the Act, but injury decreases were not uniform between industries. The Act did not appear to be protective for rates of WPV injury.

Manuscript 3: *Aim:* Assess the severity and cost burden of injury relating to SPHM, WPV, or both in Upper Midwest group homes. *Methods:* Free text incident descriptions from a private insurer's dataset of 4,364 group home workers' compensation claims were read by researchers and coded for evidence of SPHM, WPV, or both. Log binomial and log linear regressions with GEE were used to compare risk of incurring lost time and risk of incurring greater mean cost for claims relating to SPHM/WPV injury compared to other injury claims. *Results:* Claims that were associated with SPHM were more likely to result in lost time and higher mean costs than claims that involved WPV or claims that did not involve contact between workers and group home residents. Using the same metrics, claims that involved both SPHM/WPV were less severe than SPHM-only claims.

Conclusion

Although Minnesota regulates SPHM in a broader range of healthcare-related industries than most states, it still faces challenges for reducing SPHM and WPV injury. In general, SPHM regulations in the United States focus on lower-cost yet less effective administrative controls and higher acuity, shorter-term settings[8]. There is evidence that Minnesota's SPHM law was effective in reducing SPHM injury rates for the workers that it covered when compared to SPHM injury trends among workers not covered by the law. Healthcare's WPV injury rates continue to rise despite possibly beneficial changes in

SPHM workflow brought by the law. Workers in group homes, an industry excluded by Minnesota's SPHM law, are at risk of severe injury from SPHM and experience alarmingly high rates of WPV. Policymakers should consider wider definitions of healthcare to incorporate more direct care workers under SPHM protections. Researchers can investigate factors that influence both SPHM and WPV injury, such as safe staffing levels or retaliation protection, to strengthen policy approaches for reducing direct care worker injury.

Table of Contents

List of Tables

List of Figures

Organization

This dissertation is comprised of an introductory chapter, three individual manuscripts, and a concluding chapter. The three manuscripts are in preparation for separate peer-reviewed publications.

Chapter 1: Introduction

Background

Defining the Problem

The Healthcare and Social Assistance industry covers a broad range of settings and services, employing over 21 million private sector workers in the United States[1]. These workers perform diverse tasks, ranging from delivering highly technical medical care to providing social and peer support for those in addiction recovery. A commonality for many workers in this industry is the physical proximity they share with patients and other individuals receiving care, and the heightened emotional nature of direct care work. These factors can both be observed in the high injury rates among healthcare workers, which are among the highest nationwide for both musculoskeletal disorders (MSDs) and workplace violence (WPV)[3,6].

The tasks in healthcare-related settings associated with moving, lifting, and/or assisting patients with limited mobility, also known as Safe Patient Handling and Mobility (SPMH), are a major source of MSDs among healthcare workers[9]. In the absence of a national workplace safety standard for SPHM activities, several states have passed their own SPHM laws, but significant gaps in coverage remain[5]. For example, Minnesota's 2007 Safe Patient Handling Act excludes workers in residential intellectual and developmental disability, mental health, and substance abuse facilities (also known as group homes), as well as continuing care retirement communities and assisted living facilities for the elderly[10]. Although the population served by these facilities may be more mobile than other patient populations, this exclusion leaves thousands of Minnesota

workers in highly physical occupations without formal protections against SPHM hazards, which may result in severe injury[4].

The majority of workers in group homes, retirement facilities, and home healthcare services are defined by the US Bureau of Labor Statistics (BLS) as Healthcare Support Occupations, which include personal care aides, nursing assistants, and orderlies[11]. This class of workers are among the lowest paid in the healthcare industry, and are more likely to have high turnover, be lower educated, foreign-born, women, and non-white[7,12,13]. They are also at higher risk for WPV, including verbal threats and abuse, and experience more severe outcomes related to MSDs[7,14,15]. In 2021-2022, healthcare support workers experienced roughly 30% of all recorded non-fatal intentional injuries, despite making up less than 5% of the total workforce[16,17]. These recorded cases are almost certainly a significant undercount, and likely do not reflect psychological harm stemming from verbal abuse and non-physical injury[18-20]. For injuries related to overexertion in lifting or lowering, one of several possible injury definitions associated with SPHM, healthcare support occupations make up nearly 7% of all recorded cases in the US[16]. Minnesota presents a unique case to study health care aides in group homes specifically, as it relies more on group homes to provide disability services than any other state[21].

Because of the shared work factors that influence SPHM and WPV, Minnesota's status in the minority of states with an SPHM law, and Minnesota's heavy reliance on group homes to provide disability services, there is ample opportunity to research how healthcare labor policy shapes these injury risks in a marginalized and precarious occupational group.

Peer-reviewed literature

Although employer and facility-level SPHM interventions have been studied for multiple decades, relatively little peer-reviewed literature exists on SPHM policy at the state level. On the facility level, Nelson (2004) described many of the SPHM interventions that are widely used to this day and categorizing them into engineering, administrative, and behavioral controls[8]. This remains a useful framework for interpreting state-level SPHM laws passed years later. Thomas and Thomas (2014) synthesized multiple systematic reviews of SPHM interventions to identify six specific mechanisms of SPHM programs that have the capacity to result in injury reductions, including physical modifications of the work environment to enable safer SPHM tasks, and risk assessment protocols to understand the specific needs of a given facility's patient base[22]. These mechanisms greatly informed the coding protocol of the current study's legal assessment of state SPHM policies[23]. Other studies focusing on individual facility-level SPHM programs have found they are associated with significant reductions in worker injury, including in states that do not have formal legal requirements for SPHM programs[24,25].

Few studies have evaluated state SPHM laws in more than one state at a time. A nationwide survey on the prevalence of lift usage in medical-surgical and intensive care hospital units found that hospitals in states with an SPHM law were significantly more likely to report a lift being used for their patients[26]. However, this survey relied on a binary variable that did not differentiate between type or strength of state SPHM law. Among state-level policy evaluations, several studies compared injury reduction in hospitals to control groups of healthcare-related industries within the state that were not

affected by the SPHM law. In California, an analysis of workers' compensation data found that SPHM injury reductions among hospital workers, who were covered by the SPHM law, were greater than among nursing home and residential care workers over a time period spanning the passage of the law[27]. A study in Washington took a similar approach, again detecting greater reductions in injury among policy-covered hospital workers than the policy-excluded control group of nursing home workers[28]. Qualitative studies and surveys have been indispensable in describing the successes and remaining barriers to meeting the SPHM goals laid out by these laws[29,30]. One recurring theme of these qualitative studies is that time and staffing shortages can be a limiting factor when trying to adhere to proper SPHM procedures or wait for an available equipment and lift teams.

Multiple evaluations of Minnesota's SPHM law have been published, which greatly informed this research. One study used workers' compensation data to compare time-based trends of SPHM-associated injury in hospitals, nursing homes, and outpatient facilities to trends of non-SPHM injuries, finding that SPHM injury declined by a greater percentage[31]. Another study focusing only on nursing homes produced similar results and provided greater detail on associations of SPHM injury with low worker retention and rural areas[32]. Both these studies used count-based regressions with facilities as the unit of analysis, and therefore did not incorporate or make inferences about worker demographics. Like the studies in California and Washington, the present research adds to this body of knowledge by including industries that were not covered by the Minnesota SPHM law as external control groups. It also uses federal labor data sources to calculate

injury rates that can be compared between these industries and incorporates worker demographic covariates such as age and gender.

There is a vast body of research on WPV in healthcare, though its interaction with SPHM is less well studied. The SPHM policy evaluations above generally either excluded WPV from their case definitions entirely or included WPV as a descriptive outcome only. In qualitative studies, one survey indicated that home healthcare workers who performed SPHM tasks were more likely to report being assaulted by their patients[33]. In a survey on the barriers to SPHM equipment use, healthcare workers reported that some patients could become confused or uncooperative in the presence of assistive lifting devices[34]. Both of these findings imply a theoretical connection between SPHM and WPV, though more research is needed with comprehensive surveillance data to ascertain SPHM's protective or harmful mechanisms relating to WPV within current practice. However, the evidence of WPV as a principal safety concern in healthcare is extremely well documented, including issues regarding underreporting, associations with lower job status and certification, role in worker turnover, and long-lasting psychological harm[35-41].

Group homes are an understudied setting in occupational health literature[42]. They are more commonly researched in their capacity as a health intervention for the populations they serve[43-52]. As essential sites involving close contact and vulnerable populations, they were also researched in the context of Covid-19 prevention and outcomes[51,53-60]. Of studies that focused on group home workers, many were qualitative or survey-based, assessing workers' concerns about Covid precautions, residents' safety and health promotion, and their own safety given direct care activities and resident

resistance[54,56,58,61,62]. In the latter, group home workers reported regularly facing aggressive resistance when performing dental care on group home residents, including biting, spitting, hitting, and kicking[61]. Increased comfort with this job task was associated with increased experience and training as a group home worker. One commentary article sketched the history and explored case studies of unethical and unlicensed group homes, which put both staff and residents at risk and create the conditions for extreme cases of violence and abuse[63].

No peer-reviewed research was found to specifically focus on occupational injury in group homes using objective, administrative data sources like workers' compensation claims or the Survey of Occupational Injuries and Illnesses (SOII). However, a paper reporting on Ohio's workers' compensation system at large ranked group homes as the second-highest industry of concern statewide for WPV after spectator sports[64]. This same paper ranked skilled nursing facilities third, retirement communities seventh, and group homes the thirty-ninth top industry of concern out of over 250 industries for overexertion and bodily reaction, key indicators of SPHM injury[64].

Objective

This research aims to characterize the landscape of patient contact-related injury among the wider healthcare workforce in Minnesota, with a focus on workers at long-term residential disability facilities, also known as group homes. Results can inform holistic policy approaches to reducing SPHM and WPV injury, which are interrelated with the uniquely intimate tasks and responsibilities of healthcare workers.

Specific Aims

Aimt 1

Conduct a nationwide legal assessment of state-level SPHM safety and injury prevention laws for healthcare workers, with a focus on the relative scope and coverage of the state laws.

Aim 2

Evaluate the Minnesota Safe Patient Handling Act's impact on SPHM and WPV injury across multiple healthcare and residential care settings by comparing trends in workers' compensation data among covered workers with those who were excluded by the law.

Aim 3

Assess the relative severity of injuries associated with SPHM, WPV, or both among group home workers in the Upper Midwest using narrative incident descriptions in workers' compensation data from a private insurer.

Chapter 2: Policy surveillance of Safe Patient Handling and Mobility laws to reduce injury among healthcare workers

ABSTRACT

Safe Patient Handling and Mobility (SPHM) are the tasks associated with lifting, moving, transferring, and/or assisting patients with mobility in healthcare-related settings. It also refers to the procedures to carry out these tasks in a safe or ergonomic manner to reduce risk of injury to the care provider or patient. SPHM tasks are a major source of occupational injury among healthcare workers. Despite this fact, state-level policies that regulate SPHM vary widely and are not well characterized to allow for rigorous evaluation research between states. Since 2006, eleven states have enacted laws regulating SPHM to reduce healthcare worker injury. These policies tend to target higher acuity healthcare settings over lower acuity and long-term residential settings and favor administrative controls over engineering controls. This research systematically mapped all state-level SPHM policies in the United States, legal requirements, and the specific types of healthcare facilities covered. Researchers, advocates, and policymakers should consider the gaps and variation in state SPHM laws when evaluating or developing new policy.

INTRODUCTION

The healthcare and social assistance industry comprises a wide range of physical settings and facilities, many of which involve some sort of physical contact between healthcare workers and patients or residents. Due to the physical nature of caregiving work, these facilities have very high rates of musculoskeletal disorders (MSDs), with

injury rates affecting the trunk and back among the highest of any industry[2]. The Healthcare and Social Assistance industry regularly contributes the greatest injury incidence of recorded MSDs out of any industry in the United States[3]. For healthcare workers, especially those who work in direct care such as nurses and certified nursing assistants (CNAs), moving, lifting, handling, and assisting patients in mobility is a common practice, exposing workers' bodies to intense strain[4]. Patient handling may occur while transferring patients, ambulating, or assisting with activities of daily living such as bathing and toileting, though specific needs will differ based on the setting and patient population that is being served[8].

National legislation that prohibits the unaided manual handling of patients exists in at least seven nations outside of the United States[65]. After the rejection of OSHA's ergonomics standard in 2000, interest grew in state-level Safe Patient Handling and Mobility (SPHM) legislation as an intervention to reduce MSDs among healthcare workers[66]. The American Nursing Association announced their "Handle with Care" campaign in 2003, which offered groundwork for possible SPHM legislation and its rationale[67]. Additionally, some private healthcare chains have implemented their own internal SPHM policies, which have taken a variety of forms and resulted in wide ranges of success[22,68]. While these facility or employer-level interventions show some promising results, states have the power to impose a level of uniformity in SPHM policy that would ease understanding among frontline workers, streamline injury surveillance on wider levels, and provide external enforcement measures. According to nationwide survey data, hospital medical-surgical and intensive care units in states with SPHM laws were

significantly more likely to report using patient lifts than hospitals that were not covered by a state SPHM policy[26].

SPHM tends to be concentrated in higher acuity settings like hospitals or skilled nursing facilities, but patient-handling may occur in a variety of healthcare settings, even with patients or residents with high mobility. Each of these settings present their own unique concerns. Past studies have identified high-risk SPHM tasks in ambulance work and home healthcare, where ergonomic challenges can arise from variable and unpredictable physical spaces[8]. Another study found that in home healthcare, workers who reported patient-handling tasks were more likely to report being assaulted by their patients, indicating possibly causal relationships with other types of injuries[33]. Therefore, we were interested in capturing the variation in scope of SPHM laws and the different types of facilities or healthcare subsectors they cover, using North American Industrial Classification System (NAICS) codes.

Policy surveillance is a method of public health research that allows for the systematic capture, analysis, and presentation of specific issue-oriented policies across multiple jurisdictions[69]. Policy surveillance has been used to describe and analyze national abortion laws, built environment policy, state Medicaid coverage, and other public health subject areas[70-77]. No published surveillance studies have focused on systematically characterizing state-level policies that govern SPHM procedures. Healthcare policy is decentralized, with both licensing and occupational health and safety standards potentially varying at the state level, which are ideal conditions for the methodology of policy surveillance[78]. This paper aims to capture the variation of state SPHM laws to facilitate research on their effectiveness and create a better foundation for

developing healthcare labor policy moving forward. As policy interest has shifted to ensuring safe staffing levels and preventing workplace violence, issues that are both shaped by the hazards of contact with patients, a solid understanding of existing laws regarding the related area of SPHM will be useful[79].

METHODS

We followed policy surveillance methodology to assess the status and variation of state-level SPHM policies[23]. Policy surveillance aims to systematically capture elements of laws that can be coded and quantified into data that is comparable between jurisdictions. An *a priori* framework was established for determining important aspects of the law to analyze, followed by an iterative process of re-evaluation and modification of the coding protocol based on reoccurring or significant aspects of policy that arise during the coding process.

The legal framework used in developing the coding protocol was adapted from prior policy research, federal SPH program recommendations for employers, and consultations with academics, state OSHA employees, industry professionals, and representatives from organized labor [5,22,80,81]. The framework focused on capturing the variation of SPH laws between states and the policy elements that qualitative research found frontline direct care workers believed to be the most instrumental in reducing the incidence of SPHM injury[30]. Because many SPHM policies were developed at the facility or employer level, and much of the evaluation literature is devoted to those policies, we attempted to capture the areas of policy that were most readily in the purview of state regulation.

Thomas and Thomas (2014) synthesized SPHM program systematic review to identify six key mechanisms within SPHM programs that are likely to reduce patient

lifting and injury burdens on healthcare workers. These mechanisms were (1) a clear management policy that articulates a goal of reducing SPHM injury, (2) the use of SPHM equipment instead of manual or unaided lifts, (3) staff safety training to educate healthcare workers about SPHM risk mitigation, (4) risk or hazard assessments to characterize the needs of a given facility or unit's patient base, (5) having dedicated staff who could be advocates or sources of support and information for the SPHM program, and (6) physical modification of the work environment to support SPHM interventions and equipment[22]. All the legal constructs included in our policy surveillance coding protocol mapped onto or expanded at least one of these mechanisms previously identified by researchers. Because the mechanisms were synthesized from an international set of research studies that often focused on facility or employer-level interventions rather than legal requirements, some of the language in our surveillance project was modified for a United States legal context. The 2015 legislative report on state SPHM laws by Public Citizen, though not a scientific document, was useful for translating the previously identified SPHM program mechanisms into legal constructs[5].

Between the dates of February 1, 2023 and June 30, 2023, two researchers (an epidemiology student and a law student) independently searched the WestlawNext Campus Research database using the following search strategy: ("safe patient handling" OR "safe patient lift!" OR "safe resident handling" OR "safe resident lift!") AND (standard OR regulation OR rule OR policy OR require!). Searches were restricted to the state level policies for all 50 states and Washington, DC passed before January 1, 2023. When statutes or regulations that potentially contained SPHM requirements were found, researchers read the statutes themselves and tables of contents for neighboring sections of

the legal code to determine their relevance. State policies were included in the analysis if they had the stated intention of protecting healthcare or associated workers from hazards posed by physically handling or assisting patients through the routine courses of their duties, and they contained actionable or enforceable provisions to reduce healthcare worker SPHM injuries. In the interest of providing more context to the different forms SPHM policies can take and the historical progression of SPHM's legal landscape, state laws that were repealed before the end of the study period are included in the analysis.

Policies were excluded if they were broader in scope of injury or did not specify the focus of SPHM among healthcare workers (e.g. workplace violence among healthcare workers, ergonomics among general industry), or if they were suggestions intended to help employers establish their own policies without enforceable state requirements or material support from the state. For the purposes of this analysis, material support refers to financing in the forms of grants or loans that legislatures had specifically allocated for SPHM programs. Some states, as well as the federal government, offer non-legal education and guidance resources for the establishment of SPHM programs, which were not considered policies in the scope of this project[80]. To ensure that no positive state policies were excluded, this search was supplemented by consulting government and industry materials, prior peer-reviewed research, and non-academic search engines[5,9,28,65,82].

Table 1. Legal search strategy and inclusion/exclusion criteria

Search Strategy	
("safe patient handling" OR "safe patient lift!" OR "safe resident handling" OR "safe resident lift!") AND (standard OR regulation OR rule OR policy OR require!)	
Inclusion Criteria (requires both)	**Example**

• Law is intended to protect healthcare and related workers from SPHM hazards	• Text of law indicates goal of reducing SPHM injuries
• Law contains actionable or enforceable measures to meet its goal	• Law requires employers to implement measures at risk of fine, as a licensing requirement, or other penalty • Law enables material support in the form of grants, loans, or other resources for reducing SPHM injury
Exclusion Criteria (requires any)	**Example**
• Scope of law was broader than SPHM	• Ergonomics standard for general industry
• Focus of law was on healthcare hazard other than SPHM	• Workplace violence prevention in healthcare
• Contains no actionable or enforceable measures	• Legislative endorsements, non-binding resolutions

After collecting the relevant policies and regulations, one sample jurisdiction's policy was doubly coded by both researchers using the coding protocol and the findings were compared. When both researchers discussed each item in the coding protocol and consensus was reached on the sample jurisdiction's coding results, all policies deemed relevant to the project were independently coded with 100% redundancy to ensure validity of the coding framework. Researchers would meet periodically to discuss findings as well as any possible need for iteratively modifying the coding protocol. If the coding protocol needed to be modified, all previously coded jurisdictions were re-coded in accordance with the new protocol. When divergences in coding were found, the research team discussed the divergent codes until consensus was reached. A third researcher was selected to act as arbiter when consensus on coding could not be reached

between the first two researchers. At the end of the coding process, both researchers met for a final session where every item was checked in each jurisdiction to ensure 100% coding agreement. The final coding protocol is presented in Supplemental Table 1.

MonQcle, a web-based platform for policy surveillance, was used to host the legal dataset as it was being coded. Statistical analysis was conducted using SAS 9.4.

RESULTS

Between 2006 and 2022, 11 out of 50 states (22%) enacted policies to protect healthcare workers from patient handling-related hazards. Two of the eleven states, Ohio and Missouri, repealed their policies before the end of 2022. Ohio's policy, while not requiring any interventions or including any enforceable measures, did contain the actionable provision of offering financial support in the form of interest-free loans to employers who wished to enact SPHM programs, and was therefore included in this analysis. One state, Hawaii, passed a non-binding resolution offering support for the American Nurses' Association "Handle with Care" campaign regarding musculoskeletal injuries among healthcare workers, but it included no actionable measures or enforceable requirements of healthcare employers and was therefore excluded from the analysis[83]. A full list of statutes coded and included in this analysis are presented in Supplemental Table 2.

The policies in all 11 jurisdictions of this analysis applied to General Medical and Surgical Hospitals (NAICS 622110), with 10 state policies also covering Psychiatric and Substance Abuse Hospitals (NAICS 622210) and Specialty Hospitals (NAICS 622310). 8 jurisdictions included Skilled Nursing Facilities (NAICS 623110), while 2 jurisdictions included Continuing Care Retirement Communities and Assisted Living for the Elderly

(NAICS 623300) in their SPHM policies. No state policies covered Residential Intellectual and Developmental Disability, Mental Health, and Substance Abuse Facilities (NAICS 623200) or Home Health Care Services (NAICS 621600). Healthcare settings in rank order by the number of SPHM laws that cover them are displayed in Table 2.

Table 2. Healthcare settings covered by state policies

Setting	States
General Medical and Surgical Hospitals (NAICS 622110)	11 (100%)
Psychiatric and Substance Abuse Hospitals (NAICS 622210)	10 (90.1%)
Specialty Hospitals (NAICS 622310)	10 (90.1%)
Nursing Care Facilities/Skilled Nursing Facilities (NAICS 623110)	8 (72.7%)
Outpatient Care Centers (NAICS 6214)	2 (18.2%)
Freestanding Ambulatory Surgical and Emergency Centers (NAICS 621493)	1 (9.1%)
Continuing Care Retirement Communities and Assisted Living Facilities for the Elderly (NAICS 6233)	1 (9.1%)
Residential Intellectual and Developmental Disability, Mental Health, and Substance Abuse Facilities (NAICS 6232)	0 (0%)
Home Health Care Services (NAICS 621600)	0 (0%)

The most common requirements in the policies were hazard assessments to characterize the mobility and SPHM needs of the facility's patient base (90.1%), safety training (81.8%), data collection for program evaluation (81.8%), the formation of joint labor/management SPHM committees (63.6%), and the stated goal of eliminating manual lifting, or a facility "zero lift" policy (63.6%). All states that required SPHM committees also required the input of non-managerial healthcare worker staff either on the committee itself or to be consulted in SPH policy decisions. Two states (18.2%), California and New

Jersey, mandated that healthcare workers be actively consulted in the SPH decisions that affect their specific units, outside of the SPHM committee structure. Of the 9 states that required safety training, only 2 allowed workers to request additional refresher trainings. Table 3 displays the full results of the policy coding by state.

Less common aspects of the law included the provision of state funding for SPHM equipment or programs (18.2%), the inclusion of SPHM equipment-appropriate construction plans when remodeling or building new facilities (18.2%), and requiring specialized staff whose sole responsibility is to assist nurses or other caregivers on proper SPHM procedures and equipment usage, also known as lift teams (18.2%). Several state policies recommended but did not require employers to enact many of the aforementioned interventions, which are displayed in Table 4.

DISCUSSION

Research on the effectiveness of SPHM legislation is limited by the variability of laws and their scope, often resulting in state-specific analyses. An evaluation of the SPHM law in Minnesota found that, over the course of the law's implementation, workers' compensation claims for SPHM-related injuries in nursing homes showed a greater decline than claims resulting from non-SPHM injuries[32]. In California, researchers similarly found a significant reduction in SPHM-related injuries among hospital workers after the passage of their law, compared to the rates of SPHM-related injury among nursing and residential care workers who were not affected by the California law[27]. Researchers in Washington were also able to detect a reduction of MSDs among workers in hospitals, a covered industry, compared to workers in nursing homes, which were excluded from the state law[28].

Table 3. State policies to prevent SPHM injuries among healthcare workers, 2006-2023

Jurisdiction	Industries Covered	Years Valid	Agency	Hazard Assessment	SPHM Committee	"Zero Lift" policy	Workers Can Refuse Unsafe Lifts	Lift Teams Required	Funds for Programs/ Equipment	Safety Training	Data collection for program evaluation	Requirements for New Facility Construction
Minnesota	5	2007-2023	Labor**	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
New Jersey	5	2008-2023	HHS	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
New York	5	2014-2023	HHS	Yes	Yes	No	Yes	No	No	Yes	Yes	No
Illinois	4	2010-2023	HHS	Yes	No	Yes	Yes***	Yes	No	Yes	Yes	No
Maryland	4	2007-2023	HHS	No	Yes	No	No	No	No	No	No	No
Ohio	4	2007-2015*	Labor	No	No	No	No	No	Yes	No	No	No
Rhode Island	4	2007-2023	HHS	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Texas	4	2006-2023	HHS	Yes	No	Yes	Yes***	No	No	Yes	Yes	No
Missouri	3	2011-2019*	HHS	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Washington	3	2006-2023	HHS	Yes	Yes	No	Yes	No	No	Yes	Yes	No
California	1	2012-2023	Labor**	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Total n(%)	-	-	-	9 (81.8%)	7 (63.6%)	7 (63.6%)	6 (54.5%)	2 (18.2%)	2 (18.2%)	9 (81.8%)	9 (81.8%)	2 (18.2%)

*Policies were repealed by state legislatures
**Policies are considered enforceable standards under state OSHA plans
***Policies allow workers to refuse an unsafe lift, but do not specifically protect workers from employer retaliation

However, as this policy scan shows, researchers should take caution when attempting to compare the effectiveness of SPHM laws across states. Of the three states mentioned above, only California requires the presence of lift teams, an intervention that has been praised by nurses who have access to it[30]. Unlike California, Minnesota and Washington both require workplaces to instate SPHM committees made up of management and non-management workers, the effectiveness of which has been less well researched. Of these three states, Minnesota is the only one where the SPHM legislation introduces a specific funding apparatus for employers to purchase SPHM equipment, fund trainings, or make physical modifications, which could be useful for smaller or less financially secure firms[10] It is also notable that each state's law applies to a slightly different set of industries and healthcare settings, with only general hospitals being the true overlapping industry. In short, the mechanisms by which SPHM laws reduce MSDs may vary between states, possibly compromising broad evaluations of their effects.

Table 4. Detailed policy elements required by state policies

Detailed Policy Elements	States
Training is required	9 (81.8%)
- Policy requires periodic re-training	7 (63.6%)
- Employees have the right to request additional refresher trainings	2 (18.2%)
Policy outlines a way for employees to refuse dangerous or improper lifts	6 (54.5%)
- Policy specifically bars employers from retaliating against employees who refuse dangerous or improper lifts	4 (36.4%)
Policy forbids, to the extent feasible, unaided manual patient handling	7 (63.6%)
Policy requires the purchase of SPHM equipment if deemed necessary	4 (36.4%)
Policy compels employers to involve direct care workers in plan and equipment decisions that affect their specific job duties (other than serving on an SPHM committee)	2 (18.2%)

A possible strength of Minnesota's law that it shares with Ohio's is the provision of state funding to implement SPHM policies and make physical improvements. Ohio's SPHM law, though it included no enforceable restrictions on patient handling, did provide interest-free loans to hospital and nursing home employers to purchase SPHM equipment or fund SPHM program activities. Specifics regarding loan amount and eligibility were left to the Ohio Bureau of Workers' Compensation. Minnesota's law outlined grants for the purchase of SPHM equipment that were capped at $40,000 per facility, matched dollar-for-dollar by the employer. While published research is scarce on these SPHM-specific state funding programs, public investment in health and safety interventions has shown to be effective in the past. A separate Safety Intervention Grant (SIG) program for general industry employers within Ohio's workers' compensation system has existed since 1999, providing consultations and funds for employers to purchase safety equipment[41]. Employer utilization of this grant program was associated with improved workers' compensation injury rates and costs, especially among workers who were affected by the purchase of ergonomic interventions[84].

Table 5. Non-binding SPHM interventions that are suggested, recommended, or endorsed by state policy

State	Policy Suggestions for employers
Illinois	Purchasing of additional SPHM equipment, Consideration of SPHM equipment in new construction
Maryland	Hazard assessments, Training, Lift Teams, SPHM Equipment Purchasing or use, Consideration of SPHM equipment in new construction
Ohio	Written SPHM plan, Safety Training, Equipment Purchasing or use
Texas	Equipment purchasing or use, Consideration of SPHM equipment in new construction
Washington	Consideration of SPHM equipment in new construction

The "hierarchy of controls" is a useful framework for interpreting state SPHM policies and their specific elements[85]. Notably, the most common SPHM interventions in these policies (hazard assessments, safety trainings, SPHM committees, data collection, "zero lift" policies) are behavioral or administrative controls, which are generally lower priority and have lower effectiveness in the control hierarchy. These controls rely on modifying worker behaviors towards safer practices. The less common interventions (requiring lift teams, requiring equipment purchasing, construction requirements) can be described as engineering controls because they involve isolating physical hazards and therefore reducing risk to workers without modifying their behaviors or choices. Although there is some concern that lift teams represent a transferal of injury risk from one group of workers to another, when properly deployed and supported their expertise in SPHM equipment can help insulate all workers from direct lifting hazards[86]. Past SPHM intervention research has indicated that engineering controls are more effective at preventing healthcare worker injury than administrative or behavioral controls, though they can be more costly to implement because they require physical equipment purchases and modifications[8]. As previously described, public investment and financial incentives for buyers of workers' compensation insurance can help defray the cost of expensive engineering controls[84].

Mirroring the trend in policy to favor lower priority controls is the favoring of hospitals and settings for higher acuity patients over long term and residential care settings. There is a clear gap between the coverage of higher acuity settings (hospitals and skilled nursing facilities, covered by >70% of states) and lower acuity settings (outpatient care and assisted living, covered by <20% of states). While this prioritization is

reasonable, it does not offer comprehensive protection for healthcare workers, who are still at risk for SPHM injury in settings with relatively ambulatory patients[8].

Another complexity revealed by this policy scan is the question of each state law's regulating and enforcing body. Of the 11 states included in this study, Minnesota and California are the only two with SPHM laws that are considered workplace safety standards under their state OSHA plans. This means that it is dependent on their state's OSHA offices to investigate, regulate, and enforce worker protections around SPHM exposures. OSHA, at the state and federal level, follows lengthy rulemaking procedures that solicit input from workers, employers, experts, and the public when producing workplace safety standards. The remaining states with SPHM laws have built them into rules governing hospital licensing and regulation, usually as part of their Health and Human Services or related agencies. Generally, OSHA standard enforcement relies on citations and fines while enforcement of Human Services regulations may involve fines or licensing consequences for the employer. There also may be differences in mechanisms of reporting violations to the various state agencies, where some may be more catered to workers and others more catered to consumers. It is unclear which type of regulating body would be more effective at reducing SPHM injury among workers, and future researchers should consider the regulating body when evaluating these laws.

Several state policies included non-binding recommendations for SPHM interventions that employers were encouraged to implement. It is important for workers and researchers in these states to take note of non-binding language in order to be fully cognizant of the scope of the law. Maryland's law, for example, only requires the establishment of SPHM committees in each covered facility, with a list of non-required

suggestions for interventions that those committees can implement. While each suggestion addresses a major theme of SPHM policy in general, the only enforceable action an employer needs to take is ensuring that an SPHM committee is formed. Among the rest of the states, common non-binding suggestions were the purchasing of SPHM equipment and the consideration of SPHM equipment requirements when physical facility spaces are being constructed or remodeled, both engineering controls that require large amounts of startup capital.

Emerging areas of concern in healthcare worker safety are workplace violence (WPV) and safe staffing levels. WPV has long been a problem endemic to healthcare yet has grown through the Covid-19 pandemic. Ensuring adequately staffed facilities is one strategy for reducing the risk of WPV, as well as improving patient outcomes and healthcare worker retention rates[79,87,88]. Similarly, staffing levels can be a limiting factor for the effectiveness of SPHM policies, as qualitative research among nurses has revealed that there is sometimes not enough staff or access to available lift teams to safely move patients when the need arises[30]. In another study, survey results showed that limited staffing was the top barrier to nurses using assistive lifting devices[34]. As no new SPHM legislation has been passed since 2014, policymakers should take note of the possible redundancies with existing SPHM policy, or opportunities to strengthen SPHM practices, when considering additional healthcare safety measures.

Limitations

This research should be interpreted given its scope and limitations. Because the policy scan focused on states, it did not capture SPHM policies at the local or employer level. Some large healthcare employers have implemented their own system-wide SPHM

policies, which may affect thousands of workers outside of the states in this analysis[68]. Similarly, because we were interested in factors specific to healthcare, the policy scan did not capture state-level occupational ergonomics standards that are more general in target population. Minnesota OSHA enacted one such standard after the data collection period in this research ended, expanding similar policy interventions and safety investments for warehousing and meatpacking workers[89]. Other state healthcare labor regulations that did not address SPHM specifically, such as staffing level or workplace violence procedures, were also excluded.

Some misclassification of industry due to unclear language was possible. While we attempted to record covered industries by exact NAICS code, some state policies used vaguer language. Certain states referred only to "hospitals" instead of the three subclassifications of hospitals, or "nursing homes" which could colloquially indicate either Skilled Nursing Facilities (NAICS 6231) or Continuing Care Retirement Communities and Assisted Living for the Elderly (NAICS 6233). In these instances, we attempted to cross reference the target policies with definitions offered in other parts of that state's legal rules, and assumed that a reference to a broader industrial classification would include its subclassifications unless otherwise noted.

CONCLUSION

State SPHM laws are widely varied in terms of where they apply, what they entail, and how they are enforced. Existing SPHM legislation tends to favor lower-cost, lower-effectiveness administrative controls over engineering controls, and acute settings over long-term and residential settings. Researchers and policymakers should consider the specific differences in these state laws when attempting to generalize their effects. As

policymakers approach emerging issues facing the healthcare workforce, such as workplace violence or safe staffing levels, policy mapping can be a useful tool to determine redundancy and novel approaches in the policy landscape.

Acknowledgements

The authors would like to acknowledge the subject area experts who provided feedback on the coding protocol: Breca Tschida, CPE (state OSHA employee, also co-author); Neal Wiggerman, PhD (industry researcher, also co-author); Christina Rosebush, PhD (academic researcher); and Jane Thomason, MS (industrial hygienist with National Nurses United).

Chapter 3: Tracking injuries among direct care workers in the wider healthcare industry after the passage of the Minnesota Safe Patient Handling Act

ABSTRACT

Workers in the Healthcare and Social Assistance industry experience high rates of musculoskeletal disorders (MSDs), often resulting from physically moving and assisting patients. These activities, also known as Safe Patient Handling and Mobility (SPHM), are regulated as an occupational hazard in Minnesota and several other states. This project evaluates Minnesota's 2007 Safe Patient Handling Act by comparing SPHM and workplace violence (WPV) injury rates between direct care workers that were covered by the state law with those that were not covered by the state law. Between 2003 and 2019 direct care workers in Minnesota filed 39,719 injury claims across seven healthcare-related industries. During the study period, rates of SPHM injury among workers who were covered by the MN SPHM Act declined at a greater rate than rates among workers who were not covered by the Act, while WPV rates increased for all workers. Future policy should expand coverage to protect more workers from SPHM hazards and approach WPV as a pressing issue.

INTRODUCTION

Healthcare and social assistance, an industry that employs over 21 million people in the United States, is a major contributor to the national share of recorded occupational musculoskeletal disorders (MSDs)[3,90]. MSDs in healthcare can often result from handling, moving, and assisting patients with limited mobility, an area of practice known

as Safe Patient Handling and Mobility (SPHM). Although many types of healthcare workers may engage in SPHM activities in the course of the duties, a large bulk of that labor is supplied by Certified Nursing Assistants (CNAs), especially in long-term care settings[15]. CNAs drive much of the high MSD rate in healthcare overall and represent a highly diverse workforce made up largely of nonwhite, foreign-born, and women workers[3,7].

Since the repeal of OSHA's ergonomics standard in the early 2000s, several states have enacted their own laws targeting ergonomic hazards in healthcare that fall under the umbrella of SPHM[5]. Though the provisions in these policies are varied, past research has generally shown that they are effective in reducing SPHM injury. In California, for example, researchers found that the state SPHM law was effective in reducing workers' compensation claims for SPHM injuries in hospitals when compared to nursing homes, which were not covered by the law[27]. An analysis of workers' compensation claims in Washington similarly detected a potential effect of a recent SPHM law among MSD rates in hospital workers with a nursing home comparison group[28]. Qualitative and survey research in California and New York both identified promising trends and areas of improvement in healthcare workers' perceptions of their respective states' SPHM laws[30,91]. Beyond evaluations of state-based SPHM laws, there have also been ample research studies on SPHM program effectiveness at the employer and facility levels[22,68].

The Minnesota Safe Patient Handling Act was passed in 2007, requiring healthcare facilities in covered industries to conform to the state policy by January 1, 2010[10]. Minnesota's SPHM policy covered Hospitals, Outpatient Care Clinics, and Skilled Nursing Facilities, but excluded Home Healthcare providers, Retirement and

Assisted Living Facilities for the Elderly, and Residential Intellectual and Developmental Disability Facilities. Aspects of the Minnesota SPHM law included mandatory safety training, joint SPHM committees made up of frontline workers and management, a requirement that newly constructed healthcare facilities conform to the physical needs of SPHM equipment, and state funds allocated to support the enactment of SPHM programs. Past research on Minnesota's SPHM law indicates that it has been effective in reducing SPHM injury amongst healthcare workers, but research has been limited to analyses without external comparison groups of workers that were unaffected by the new law[31,32]. External comparison groups, where changes in injury rates within an industry covered by a new policy are compared to those within an industry excluded by a new policy, have been useful for past SPHM research in other states[27,28]. Additionally, Minnesota's SPHM law covers a slightly different set of facilities than other states' SPHM laws, increasing the need to evaluate each state's law on its own terms[5].

Workplace violence (WPV) is another hazard of growing concern in the healthcare industry, with healthcare workers making up the bulk of all reported non-fatal WPV injuries in the United States[6]. Like the OSHA ergonomics standard, WPV in healthcare has been the site of past unsuccessful attempts at creating a national safety standard to protect workers[92]. WPV is often underreported among healthcare workers and may have lasting physical or psychological effects, potentially resulting in job turnover or Post Traumatic Stress Disorder (PTSD)[79,93,94]. Though WPV may affect any type of worker, it is of particular concern in the healthcare industry due to the close contact and required SPHM duties that nurses and other direct care workers may have with patients, possibly in patients' own homes or without others in the room[18,33,40]. Because SPHM

policies modify this pathway for patient-on-worker WPV to take place in healthcare, for example by streamlining lifting procedures with equipment or providing trained lift teams to perform delicate SPHM maneuvers, we were interested in determining if Minnesota's SPHM policy influenced rates of WPV in healthcare settings. Healthcare workers have reported in past survey research that SPHM duties can put them at risk for WPV, and that the threat of WPV can influence decision-making around SPHM procedures[33,34].

This project aims to build on past SPHM policy evaluation research in Minnesota by comparing injury reductions among policy-affected healthcare workers to injury reductions in a comparison group of non-policy-affected healthcare workers. Additionally, it tracks rates of WPV as a secondary outcome that is feasibly associated with the pathways of SPHM injury. This research can be used by advocates and policymakers to determine next steps in improving SPHM and WPV policy or inform new policies for the protection of healthcare workers.

METHODS

Study Design

This policy evaluation compares changes in workers' compensation claim rates among workers in healthcare-related industries that were affected by the MN SPH Act against an external comparator group of workers in healthcare-related industries that were not affected by the MN SPH Act. While the time periods of analysis and outcome measures in this study were first used in prior evaluation research on the MN SPH Act, the underlying study population was apprehended using a novel approach to facilitate inter-industry comparisons[32]. Seven industries were chosen for this analysis, four that were affected by the policy (General and Psychiatric Hospitals, Skilled Nursing Facilities,

Outpatient Care Centers) and three that were excluded from the policy (Home Health Care Services, Retirement and Continuing Care Communities for the Elderly, and Residential Intellectual/Developmental Disability, Mental Health, and Substance Abuse Facilities), in order to capture a breadth of workplace settings in the wider Healthcare and Social Assistance sector.

Data sources and variables

Injury data was accessed from the Minnesota Department of Labor and Industry (MNDLI) state workers' compensation database. MNDLI collects and holds data on all WC indemnity claims resulting in 3 or more missed days of work from eligible employers within the state. Claims are pre-coded by MNDLI using the Occupational Injury and Illness Classification System (OIICS), which specify the injury's source, nature, event, and part of body affected. In order to most precisely detect the effects of SPHM policy change, claims were restricted to the four major Standard Occupational Classification (SOC) codes whose workers would conceivably have the most patient contact (21: Community and Social Service Occupations, 29: Healthcare practitioners and technical occupations, 31: Healthcare support occupations, 39: Personal Care and Service Occupations).

While there is no official BLS definition for SPHM-related injury, we reclassified claims into case categories by OIICS code using definitions from prior SPHM research in Minnesota[15]. These were: all MSDs as defined by the US BLS, Broadly-defined SPHM injury (source=patient/resident), Narrowly-defined SPHM injury (MSD + source = patient/resident), and patient-related workplace violence (event=violence, source=patient/resident) (see Supplemental Tables 3 and 4 for full list of outcome

definitions) [95]. A new version of OIICS was adopted in 2012 which affected some of these coding definitions and greatly expanded definitions of WPV[96].

Denominator data was accessed from the US Census Bureau's Quarterly Workforce Indicators (QWI), a data tool that uses estimates from the Census's Longitudinal Employer-Household Dynamics program. QWI provides yearly estimates of all workers in any industry within a given state, broken down by sex and age group. Industries are defined by 4-digit North American Industry Classification System (NAICS) code. This denominator data of workers-at-risk was linked with aggregated injury counts from the WC system by strata of year, sex, age group, and 4-digit NAICS code.

The estimates of workers-at-risk were further adjusted using Occupational Employment and Wage Statistics (OEWS) data, which break down proportions of workers in each industry by SOC code. For this project, only workers who were determined to have direct contact with healthcare facility patients or residents were considered at risk for SPHM injury, therefore the denominators were multiplied by the proportion of relevant SOC codes for each industry (see Supplemental Table 5 for proportions of direct care SOC code in each industry). While it is possible that any employee of a healthcare facility may be at risk of violence from a facility patient or resident, we were primarily interested in violence that may occur during routine care or whose exposure could be affected by changes in SPHM policy.

Analyses

Using negative binomial regression, we estimated rates of patient-related injuries across four time periods spanning the passage and implementation of the MN Safe Patient Handling Act, using the same time cut points as prior SPHM research (Pre-law:

2003-2007, Implementation: 2008-2010, Post-Law 1: 2011-2013, Post-Law 2: 2014-2019)[31,32]. Regressions controlled for age group and sex with an offset variable for workers-at-risk. Rate Ratios were calculated comparing the baseline pre-law time period to subsequent time periods for each industry individually, and additionally for aggregated sets of direct care workers by whether or not they were employed in an industry covered by the MN Safe Patient Handling Act. In the regressions on aggregated sets of direct care workers, the change in injury rate by policy intervention was tested for statistical significance with a "Time Period*Policy" interaction term. All statistical analyses were conducted in SAS 9.4.

Finally, we calculated a Prevention Index (PI) for ranking the industries in this study by an aggregate of injury rates and counts. The PI is a tool used in occupational health research for prioritizing industries for safety interventions by determining a rank order of injury burden using an average of injury rate rank and count rank[97-99]. The PI was calculated using only the most recent data time period (2014-2019) in order to provide a more contemporary impression of injury trends after the implementation of the new policy.

Table 6. Direct Care Workers' Compensation Claims 2003-2019

		Covered by MN SPH Act		Not Covered by MN SPH Act	
		N	Percent	N	Percent
Sex					
	Female	26,880	87.87	7,974	87.34
	Male	3,637	11.89	1,142	12.51
	Missing	72	0.24	14	0.15
Age					
	15-24	3,013	9.85	1,150	12.6

24-34	6,731	22	2,005	21.96
35-44	7,003	22.89	1,852	20.28
45-54	7,715	25.22	2,196	24.05
55-64	5,192	16.97	1,495	16.37
65+	712	2.33	346	3.79
Missing	223	0.73	86	0.94
Tenure				
<3 months	1,876	6.13	1,090	11.94
3-11 months	4,676	15.29	2,070	22.67
1-5 years	9,889	32.33	3,357	36.77
>5 years	13,040	42.63	2,114	23.15
Missing	1,108	3.62	499	5.47
Major SOC Group				
21 - Community and Social Service Occupations	293	0.96	762	8.35
29 - Healthcare Practitioners and Technical Occupations	13,258	43.36	967	10.59
31 - Healthcare Support Occupations	16,378	53.56	5,584	61.17
39 - Personal Care and Service Occupations	580	1.9	1,779	19.49
Missing*	80	0.22	38	0.39
4-digit NAICS				
6214 - Outpatient Care Centers	1,834	5.99	-	-
6216 - Home Health Care Services	-	-	2,532	27.73
6221 - General Medical and Surgical Hospitals	16,988	55.54	-	-
6222 - Psychiatric and Substance Abuse Hospitals	676	2.21	-	-
6231 - Nursing Care Facilities (Skilled Nursing Facilities)	11,091	36.26	-	-
6232 - Residential Intellectual/Developmental Disability, Mental Health, and Substance Abuse Facilities	-	-	4,385	48.03

6233 - Continuing Care Retirement Communities and Assisted Living for the Elderly	-	-	2,213	24.24
Injury Type				
SPHM (Broad)	14,908	48.74	4,380	47.97
SPHM (Narrow)	12,196	39.87	2,768	30.32
All MSDs	23,636	77.27	6,040	66.16
WPV	2,058	6.73	1,367	14.97

**Claims with missing SOC group were included in analysis if injury source was patient/resident. Over 95% of claims where the injury source was patient/resident belonged to one of the four SOC groups of interest.*

RESULTS

Between 2003 and 2019, direct care workers from the seven Minnesota healthcare industries in this analysis filed 39,719 lost-time workers' compensation claims. 12,899 of these claims, or 32.5%, came from workers under the age of 35. Industries covered by the MN SPH Act provided 30,589 claims while 9,130 claims originated from the control group industries. Broken down by SOC code, over 96% of claims among the policy-affected workers were from Healthcare Practitioners and Technical Operations or Healthcare Support Operations. In the workers excluded from the policy, there was more representation from Community Social Service Occupations and Personal Care and Service Occupations, making up almost 28% of the control group claims. The largest contributor to claims among policy-affected industries was General Medical and Surgical Hospitals at 56%, while the largest contributor of control group claims was Residential Intellectual/Developmental Disability, Mental Health, and Substance Abuse Facilities at 48%. Narrowly-defined SPHM injuries made up almost 40% of claims among workers

covered by the policy and over 30% of the claims among workers not covered by the policy.

Table 7. Rate Ratios and Predicted Mean Rates of Injury Types Across all Industries by Policy Intervention

	Pre-Law (2003-2007)		Implementation (2008-2010)		Post-Law 1 (2011-2013)		Post-Law 2 (2014-2019)	
	Rate**	**Rate Ratio***	**Rate****	**Rate Ratio***	**Rate****	**Rate Ratio***	**Rate****	**Rate Ratio***
Not Covered by the MN SPH Act								
All MSDs	3.06 (2.81-3.33)	1 (ref)	2.90 (2.63-3.20)	0.95 (0.85-1.06)	2.63 (2.39-2.89)	0.86 (0.77-0.96)	2.15 (1.99-2.33)	0.70 (0.64-0.77)
SPHM Broad	3.65 (3.38-3.94)	-	3.18 (2.91-3.48)	0.87 (0.79-0.96)	3.15 (2.89-3.43)	0.86 (0.78-0.95)	2.78 (2.59-2.98)	0.76*** (0.70-0.83)
SPHM Narrow	2.40 (2.18-2.64)	-	2.31 (2.07-2.58)	0.96 (0.85-1.09)	2.02 (1.81-2.25)	0.84 (0.74-0.95)	1.43 (1.31-1.57)	0.60 (0.53-0.67)
WPV	1.07 (0.94-1.22)	-	0.81 (0.69-0.96)	0.76 (0.62-0.93)	1.17 (1.02-1.33)	1.09 (0.92-1.30)	1.55 (1.42-1.69)	1.45*** (1.26-1.67)
Covered by the MN SPH Act								
All MSDs	8.03 (7.59-8.49)	1 (ref)	7.27 (6.78-7.80)	0.91 (0.83-0.98)	6.32 (5.88-6.78)	0.79 (0.72-0.86)	5.22 (4.95-5.51)	0.65 (0.61-0.70)
SPHM Broad	6.41 (6.03-6.82)	-	5.63 (5.21-6.08)	0.88 (0.80-0.96)	5.01 (4.63-5.41)	0.78 (0.71-0.85)	4.17 (3.93-4.42)	0.65*** (0.60-0.70)
SPHM Narrow	6.33 (5.88-6.82)	-	5.63 (5.12-6.19)	0.89 (0.79-1.00)	4.80 (4.36-5.29)	0.76 (0.67-0.86)	3.39 (3.15-3.65)	0.54 (0.48-0.59)
WPV	0.70 (0.63-0.78)	-	0.66 (0.58-0.76)	0.94 (0.80-1.11)	0.95 (0.85-1.06)	1.35 (1.17-1.57)	1.46 (1.36-1.57)	2.09*** (1.85-2.35)

**Adjusted for age group and sex.*

***Claims per 1,000 direct care workers. Adjusted for age group and sex.*
**** Indicates p<0.05 for Type 3 LR Statistics of "Time Period*Policy" interaction term.*

In industry-specific analyses, rates of Narrow SPHM trended downward but varied by industry. Policy-affected Outpatient Care Centers had an RR of 0.10 (95% CI 0.06-0.15) compared to the pre-law time period, while the RR in non-policy affected Continuing Care Retirement Communities and Assisted Living Facilities for the Elderly was 0.73 (95% CI 0.59-0.90). Policy-affected Skilled Nursing Facilities had a significantly steeper decline in Narrow SPHM injury, with an RR of 0.50 (95% CI 0.44-0.57) compared to the pre-law time period. A graph of narrowly-defined SPHM injury rates by industry can be seen in Supplemental Figure 1.

General and Psychiatric Hospitals, both affected by the SPHM policy, showed the steepest increase in rates of WPV, with RRs of 3.24 (95% CI 2.65-3.96) and 5.47 (95% CI 3.89-7.71) respectively. No industries saw a statistically significant reduction in WPV compared to their pre-law rates, though rates in Skilled Nursing Facilities (RR=1.08, 95% CI 0.90-1.29) and Outpatient Care Centers (RR=0.37, 95% CI 0.14-1.03) did not grow significantly either. Graphs of WPV injury rates by industry can be seen in Supplemental Figures 2 and 3.

The PI analysis ranked the industries in order of injury concern for the years 2014-2019 by incorporating both rates and counts of injury. Skilled Nursing Facilities topped the list for both Broadly and Narrowly-defined SPHM Injury, while General Hospitals were top for MSDs and Residential Intellectual and Developmental Disability Facilities were top for WPV. Outpatient Care Clinics were the lowest priority for all injury types. Prevention Indexes are provided in Table 9 and with a more detailed version in Supplemental Table

DISCUSSION

The results of this analysis mirror national trends for the study period, which saw declines in the rates of MSDs in all industries but increases in WPV, especially within Healthcare and Social Assistance[3,6,100]. However, this study provides evidence that in Minnesota, direct care workers in healthcare settings that were covered by the MN Safe Patient Handling Act saw greater relative declines of MSD and SPHM injury rates than direct care workers in settings that weren't covered by the Act. As aggregated by policy intervention, broadly-defined SPHM injury rates were significantly lower relative to their baseline in the policy-affected industries than in the non-policy industries. The declines in relative rates for all MSDs and narrowly-defined SPHM injuries were not significantly different across the policy groups, but the point estimates conformed to the trend of greater reductions among workers who are covered by the policy.

More detail is revealed in industry-specific analyses. Though having a lower baseline rate, policy-affected Outpatient Care Centers saw the greatest relative reduction in their narrowly-defined SPHM injury rates, at a reduction of 91% compared to the pre-law rate. With a much higher baseline SPHM injury burden, policy-affected Skilled Nursing Facilities reduced their narrowly-defined SPHM injury rates by half, yet they still remain the top industry of concern based on the PI analysis. Importantly, Retirement Communities and Assisted Living Facilities for the Elderly, which were excluded from the policy but have possibly the most similar patient base to Skilled Nursing Facilities, had a significantly smaller reduction in this type of injury rate (see Figure 1). Assisted Living Facilities are the third-highest industry of concern for narrowly-defined SPHM injury in the final time period of the analysis, with a rate of 2.74 lost time claims per

1,000 workers between 2014-2019. This mirrors findings from an analysis of workers' compensation data in Ohio, where Assisted Living Facilities were determined to be the seventh highest industry of concern statewide for injuries related to overexertion and bodily reaction, and Skilled Nursing Facilities tied for third[64]

Table 8. Rate Ratios of Narrowly-Defined SPHM Injury Across Time Period by Industry

	Pre-Law (2003-2007)		Implementation (2008-2010)		Post-Law 1 (2011-2013)		Post-Law 2 (2014-2019)	
	Rate*	**Rate Ratio****	**Rate***	**Rate Ratio****	**Rate***	**Rate Ratio****	**Rate***	**Rate Ratio****
Not Covered by the MN SPH Act								
Residential Intellectual/ Developmental Disability	1.83 (1.57-2.13)	1 (ref)	1.86 (1.56-2.21)	1.01 (0.83-1.24)	1.37 (1.14-1.65)	0.75 (0.61-0.93)	0.87 (0.74-1.04)	0.48 (0.39-0.58)
Home Healthcare	2.40 (1.98-2.92)	-	2.22 (1.80-2.73)	0.92 (0.74-1.16)	1.94 (1.58-2.38)	0.81 (0.64-1.01)	1.17 (0.98-1.40)	0.49 (0.40-0.59)
Retirement/ Assisted Living for Elderly	3.74 (3.12-4.50)	-	3.37 (2.72-4.19)	0.90 (0.70-1.16)	3.45 (2.82-4.23)	0.92 (0.72-1.18)	2.74 (2.34-3.21)	0.73 (0.59-0.90)
Covered by the MN SPH Act								
Hospitals (General)	5.13 (4.75-5.53)	1 (ref)	4.90 (4.46-5.38)	0.96 (0.85-1.07)	4.15 (3.77-4.56)	0.81 (0.72-0.91)	3.26 (3.03-3.51)	0.64 (0.58-0.70)
Hospitals (Psychiatric)	1.88 (1.16-3.06)	-	1.28 (0.64-2.55)	0.68 (0.31-1.51)	1.59 (0.82-3.10)	0.84 (0.39-1.84)	0.95 (0.53-1.70)	0.50 (0.25-1.02)
Skilled Nursing Facilities	7.46 (6.75-8.25)	-	6.26 (5.51-7.12)	0.84 (0.72-0.98)	5.30 (4.64-6.05)	0.71 (0.61-0.83)	3.72 (3.35-4.13)	0.50 (0.44-0.57)
Outpatient Care Clinics	4.77 (3.82-5.96)	-	3.20 (2.40-4.26)	0.67 (0.49-0.92)	2.63 (1.95-3.54)	0.55 (0.40-0.77)	0.46 (0.30-0.70)	0.10 (0.06-0.15)

**Claims per 1,000 direct care workers. Adjusted for age group and sex.*
***Adjusted for age group and sex.*

In contrast to these results, policy-excluded Residential Intellectual/Developmental Disability Facilities and Home Healthcare providers saw greater relative reductions in narrowly-defined SPHM injury than policy-affected General Hospitals, a key setting of concern in SPHM interventions. This reduction exists even though Home Healthcare and Residential Intellectual/Developmental Disability facilities both generally operate out of residential houses instead of large medical facilities, limiting the ability for equipment and physical modifications to reduce exposure to SPHM hazards. Significantly, workers in all industries that were excluded from the MN SPHM Act do experience Narrow SPHM injury, indicating it is not a phenomenon constrained to high acuity medical settings such as hospitals or skilled nursing facilities.

Notably, rates of WPV grew significantly faster in industries affected by the SPHM policy than in non-affected industries, indicating that either the SPHM policy was ineffective at reducing WPV risk or any protective effects were overshadowed by other factors. Because General and Psychiatric Hospitals appear to be the main drivers behind the increase of WPV in policy-affected industries, factors specific to those settings should be investigated in further WPV research. It is also possible that some aspects of SPHM policy could the increase risk of WPV, as surveyed healthcare workers have reported that some patients can become uncooperative or confused around SPHM assistive devices[34]. The Minnesota SPHM law does not protect workers from employer retaliation if they refuse to perform a lift they feel is unsafe, which may exacerbate heightened situations involving uncooperative patients[5].

There are several possible explanations for the narrow differences in RR between policy and non-policy settings. With the increased publicity around SPHM issues through

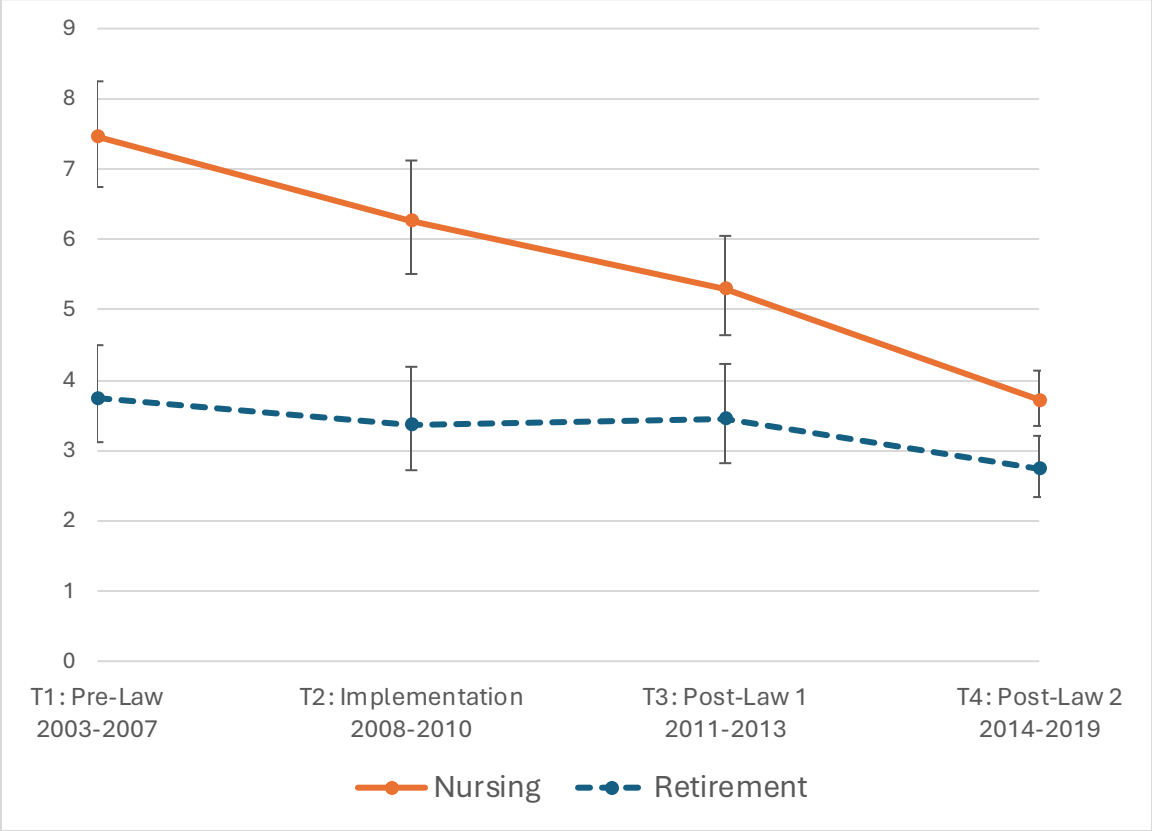
the 2000's and 2010's, there may have been general cultural change around navigating SPHM hazards across the healthcare industry, regardless of enforceable policy. At the national level, OSHA produces educational resources for education for both workers and employers who wish to implement SPHM programs, despite the absence of a national SPHM or ergonomics standard[80]. In a Minnesota context, if large healthcare employers operated multiple facility types, they may have opted to instate blanket SPHM policies covering all their workers once the law required it in certain facilities. Large healthcare employers have enacted SPHM policies in the past as cost saving measures without the existence of state regulation[68].

Despite improvements in claim rates for SPHM-related injury, both SPHM and WPV remain pressing issues. Notably, all data in this analysis was collected before the beginning of the Covid-19 pandemic, during the early months of which the intensity of WPV in healthcare settings remained steady despite a large decrease in patient volume[37]. Many healthcare workers who remained working on-site during the early pandemic reported increased WPV and verbal abuse while caring for Covid-19 patients, and increased difficulty in reporting these incidents[19]. Workers' compensation claims for mental stress and disorders, which may be a direct result of WPV that is does not readily appear in that type of data, increased significantly among nursing home workers through the pandemic[101]. The top industry of concern for WPV in the PI analysis, Residential Intellectual and Developmental Facilities, are especially noteworthy due to having both high rates and counts of instances of WPV that were recorded as lost time workers' compensation claims. This finding reflects trends elsewhere in the country, as a PI analysis of workers' compensation claim in Ohio reported that these facilities were the

second highest industry of concern statewide for incidence of recorded WPV, surpassed only by spectator sports[64].

For SPHM-related injury, qualitative and survey research among healthcare workers in facilities with SPHM policies reveals gaps and weaknesses in current programs. A primary barrier in using prescribed lift equipment or following SPHM policy is reported to be staffing shortages and limited time in accessing equipment or lift teams[30,34,86]. Staffing shortages have also been associated with increased need for restraints of aggressive patients and general burnout or turnover among healthcare workers[79,88]. Future policies that target safe healthcare staffing levels may address the double aim of improving healthcare worker wellbeing while strengthening existing SPHM policies.

Figure 1. Incidence Rate of Lost Time SPHM (Narrow) Claims in Skilled Nursing Facilities and Retirement Homes for the Elderly per 1,000 direct care workers



Limitations

Several limitations of this analysis need to be considered. First, the MNDLI workers' compensation database only allows access to claims that resulted in >3 days of lost work time, indicating that all injuries in this database are relatively severe. Therefore, this analysis is limited in what it reveals about incidence of injury overall. In other words, it is possible that rates of MSDs are not falling overall but becoming less severe, or that rates of WPV remain steady while their average severity increases. Additionally, the OIICS coding transitioned from v1.01 to v2.01 in 2012, adding increased injury detail and greatly expanding definitions of WPV[32]. This change may have inflated injury rates in the later time periods of the analysis.

Another limitation of the data sources is underreporting in workers' compensation claims, especially of WPV. Though it has advantages over OSHA logs and other injury data sources for its administrative function of compensating employees, the WC system still suffers from reporting barriers and biases[102]. Underreporting WPV in healthcare has unique factors, as workers who experience WPV may be hesitant to report it if it did not result in serious physical injury or if their patient did not have the capacity for rational decision-making[40]. Furthermore, because the data in this analysis represented only the most physically debilitating injuries, there is a wide variety of WPV incidents that it may not capture, such as psychologically-damaging verbal or emotional abuse and more minor physical injury[35,93]. This analysis also excludes all WPV which did not originate from a patient or resident, and should not be understood to reflect other types of WPV. Therefore, the WPV rates presented in this analysis should be considered an estimate of severe Type 2 WPV injury (where the source is a patient/client as opposed to coworker or other individual), but a potentially massive undercount of WPV overall.

The denominator data in this analysis also had limitations. The Census Bureau's QWI data does not distinguish between full-time and part-time workers, which may especially bias estimates of Home Healthcare injury rates, CNA injury rates, or other industries and occupations where part time work is more common. The method of linkage for calculating injury rates in this analysis also relied on gender and age data, which were missing in some claims and thus barred those claims from the final analysis. It is feasible that direct care workers who are transgender or LGBT may be both more likely to experience WPV and more likely to have their gender go unrecorded in the WC case data. Further WPV research in healthcare should prioritize workers of marginalized gender and

sexual identities. Similarly, information on race and immigration status was unavailable in the WC database, which shapes the job experiences of many direct care workers in healthcare[7].

Table 9. Prevention Indexes, 2014-2019

SPHM (Broad)				**SPHM (Narrow)**			
Prevention Index		Rate Rank	Count Rank	Prevention Index		Rate Rank	Count Rank
1	SNF	2	2	1	SNF	1	2
2	Gen. Hospital	3	1	2	Gen. Hospital	2	1
3	Psych. Hosptial	1	6	3	R/AL	3	3
4	R/AL	4	4	4	HHC	4	4
5	Group Home	5	3	5	Group Home	6	5
6	HHC	6	5	6	Psych. Hospital	5	7
7	OC	7	7	7	OC	7	6
WPV				**MSDs**			
Prevention Index		Rate Rank	Count Rank	Prevention Index		Rate Rank	Count Rank
1	Group Home	2	2	1	Gen. Hospital	1	1
2	Gen. Hospital	3	1	2	SNF	2	2
3	Psych. Hospital	1	4	3	R/AL	3	3
4	SNF	5	3	4	HHC	5	4
5	R/AL	4	5	5	Psych. Hospital	4	7
6	HHC	6	6	6	Group Home	6	5
7	OC	7	7	7	OC	7	6

SNF = Skilled Nursing Facilities, R/AL = Retirement and Assisted Living for the Elderly, HHC = Home Healthcare, OC = Outpatient Care. "Group Home" is used interchangeable with Residential Intellectual and Developmental Disability, Mental Health, and Substance Use Facilities.

CONCLUSION

This analysis presents evidence that the Minnesota Safe Patient Handling Act was effective in reducing rates of SPHM injury among affected healthcare workers. This was the first evaluation of the MN SPH Act to compare direct care workers that were covered by the policy to a comparison group of direct care workers that were not covered by the policy. WPV remains a pressing issue of increasing severity across the healthcare system, but especially in hospitals and residential care facilities. Given that SPHM and WPV risk exist in all the healthcare sectors in this analysis, policymakers should consider broadening the purview of healthcare worker safety regulation to affect more workplaces. Policies focusing on adequate staffing levels affect the pathways of both SPHM and WPV injury and may reinforce the effectiveness of the current legislation.

Chapter 4: Evaluating the occupational injury burden associated with patient handling and workplace violence in group homes

ABSTRACT

Residential intellectual and developmental disability, mental health, and substance abuse facilities, also known as group homes, are an understudied subsector of the Healthcare and Social Assistance industry. However, many of the healthcare industry's most pressing injury hazards exist in group homes, including Safe Patient Handling and Mobility (SPHM) and Workplace Violence (WPV). This study analyzed 4,364 workers' compensation claims from group homes in the Upper Midwest to ascertain severe injury risk associated with SPHM and WPV. Narrative text descriptions of claims were read and coded for SPHM, WPV, or both. Log binomial and log linear regressions with GEE were used to model risk of a lost time claim and mean claim cost. Injuries that were associated with SPHM activities were more likely to result in a lost time claim and incur a higher claim cost, while injuries that were associated with WPV were less likely to result in a lost time claim or higher claim cost.

INTRODUCTION

Residential intellectual and developmental disability, mental health, and substance abuse facilities, also known as group homes, are underrepresented workplaces in occupational health and safety literature[42]. Typically, group homes provide housing and 24-hour staff support to children or adults who require assistance with some activities of daily living, but do not require the same level of care offered in hospitals or skilled

nursing facilities. However, group homes can present many of the same occupational hazards as more acute healthcare facilities, including workplace violence (WPV), patient-handling injuries, falls, stress, and biological exposures[56,59,61,103]. The US Bureau of Labor Statistics' Survey of Occupational Illness and Injury data (SOII) indicates that in 2022, group home residential care facilities experienced a rate of 4.8 recordable injuries per 100 FTEs, which is higher than most ambulatory clinics and above average for the healthcare and social assistance industry overall[90].

Direct long-term care occupations, like those in group homes, are concentrated among younger, less-skilled care workers, who are more likely to receive lower wages, be students, hold outside jobs, be women, be foreign-born, or of a racialized minority[7,12,104]. Many of these factors have been associated with increased risk of injury or turnover[13,36,105]. According the US Bureau of Labor Statistics, the most common occupation in the Nursing and Residential Care Facilities industry are home health aides, for whom the median hourly wage was $16.82 as of 2023[106]. Health aides, especially those who are mothers and work in long-term care, did not see as robust a recovery in turnover rate as other healthcare occupations through the course of the Covid-19 pandemic[107].

The physical movement and manual assistance of healthcare patients by staff, also known as Safe Patient Handling and Mobility (SPHM), is a growing concern in the healthcare industry, with some states attempting to mitigate SPHM hazards through legislation[5,9,27,32]. Despite this, group homes have historically been excluded from such legislation, and the injury burden from SPHM hazards in group homes remains uncharacterized[5]. Group home workers regularly perform direct and personal care for

residents, including toileting, brushing teeth, and changing, which all may involve awkward physical positions and bodily strain[59,61]. In hospitals, SPHM hazards are generally managed by a combination of administrative controls such as joint labor/management committees and safety trainings, and engineering controls like motorized assistive lifting equipment[8]. Group homes, which operate out of residential houses, are not designed to accommodate large SPHM equipment and staff lack many of the administrative support systems of more traditional healthcare settings[100]. Nevertheless, group homes and their primary workers contribute to the high levels of musculoskeletal disorder (MSDs) seen across the Healthcare and Social Assistance industry[3].

Additionally, interest in WPV at healthcare settings has been steadily growing, especially after numerous high-profile instances of WPV during the Covid-19 pandemic[14,37,108]. The US Congress passed a bill in 2021 that would have directed the Occupational Safety and Health Administration (OSHA) to enact a WPV prevention standard, specifically mentioning group homes as a targeted setting, though it failed to pass in the Senate[92]. The two 5-digit North American Industrial Classification System (NAICS) codes that encompass most group homes were tied for second place as the highest industries of concern for WPV based on a recent analysis of Ohio's workers' compensation database[64]. Though distinct from home healthcare providers, group home workers face similar challenges with experiencing and reporting WPV due to close contact with their patients/residents, the relative isolation in residential settings, and the possible physical, emotional, or psychological impairment of the care population[18,40]. Unlike hospitals, there are no additional security personnel in group homes, where the

number of workers during a given shift could be as low as one or two[54]. Although they are not the norm, unlicensed and unethically managed group homes have a well-documented history of creating exploitative and dangerous environments for both residents and staff, enabling violence from either population[63].

The objective of this study is to determine to what extent injuries resulting from WPV and SPHM make up the profile of workers' compensation claims among group home workers, and to analyze the relative severity of WPV and SPHM-associated claims. To date, we know of no published research with the primary aim of characterizing the burden of occupational injury among group home workers using objective, administrative injury data. Past research has instead generally focused on psychosocial or other health outcomes for group home residents or has investigated other aspects of group home employment[47,48,52,63,109]. This research can inform policymakers and advocates who wish to improve disability and social assistance services for both the workers and the individuals receiving care.

METHODS

Study Design and Data

We analyzed workers' compensation claims stemming from injuries sustained by group home employees in the Upper Midwest, occurring between 2006 and 2017. The outcomes of interest were the relative severity of workers' compensation claims involving SPHM and/or WPV compared to other claims, determined by claim cost and risk of requiring time off work. Data was provided by a private insurance company that serves regional group home employers. Variables in the data included claimant age, gender, de-identified employer, and job title; injury nature, cause, and body part per the Workers'

Compensation Insurance Organizations (WCIO) framework; and narrative descriptions of the claim activity. Researchers read the claim activity descriptions and coded them for incidents of SPHM, WPV, or both. Multiple coders were involved to maximize validity of the coding scheme.

Activities involving SPHM were determined using definitions provided by the Minnesota Department of Labor and Industries (MNDLI), which has been used for prior SPHM research (See Supplemental Table 7)[31]. Some examples of SPHM activities recognized by MNDLI include "Transporting patient in wheelchair", "Transferring patient in/from toilet", and "Fall prevention/fall recovery". Incidents involving violence were categorized using keywords derived from the US Bureau of Labor Statistics' Occupational Injury and Illness Classification System (OIICS) and prior WPV research occupational injury research in healthcare, including "aggressive", "resist", "attack", and others[27,93,96]. Because MNDLI considers "managing uncooperative/aggressive behavior" an SPHM activity, descriptions of injuries incurred during physical restraints or redirections were considered positive for both SPHM and WPV. As past SPHM research has sometimes excluded instances of WPV in their analysis despite the possible overlap between the two, we felt it was important to have a category of analysis that incorporated their interaction[27]. We focused on Type 2 WPV (client/patient-on-worker) in order to better understand the multiple ways physical contact with residents shape occupational injury in group homes, therefore instances of WPV from other sources were not counted as WPV in the final results[40].

Statistical Analysis

Multiple outcomes were examined to gauge injury severity from incidents of SPHM and WPV. We used log binomial regression with GEE for the binary outcome of predicting an indemnity claim, or one where the employee required wage replacement for time away from work, as opposed to a claim that only covered medical costs. This binary distinction has been used as a proxy for injury severity in prior OHS research[15,41]. Separate models were run using SPHM and WPV as distinct exposures, comparing their outcomes to injuries that did not result from SPHM or WPV. A final log binomial model was used to test for interaction between the presence of SPHM and WPV in risk of experiencing a lost-time claim.

Claim cost was used as a continuous measure of injury severity. We used 2-part hurdle models to examine the costs associated with claims involving SPHM and WPV compared to all other claims. Hurdle models have been gaining popularity for medical expenditure data because of the high number of observations with a cost of 0 and the right-leaning skew of cost distributions[110]. In the hurdle model's first part, we used log binomial regression to predict which claims would have a cost of 0 as opposed to those with a cost greater than $0. In the second model, which only included observations with costs greater than $0, we used log linear regression with a gamma distribution to compare the ratio of means (RoM) of the injuries of interest compared to all other injuries. Costs were adjusted for inflation to 2017 dollars. As over 98% of claims were closed, no adjustments were made for claim development. All models were adjusted for worker age, gender, state, and year of injury. GEE was used in all models to account for possible correlation by the 305 unique employers represented in the dataset. All analyses were performed using SAS 9.4.

RESULTS

Table 10. Workers' Compensation Claims from Upper Midwest Group Homes by resident contact type, 2006-2017

	Total		No Contact		SPHM Only		WPV Only		SPHM & WPV	
	N	%	N	%	N	%	N	%	N	%
Gender										
F	3,198	73.28	1,640	74.75	580	84.8	627	69.59	351	60
M	1,166	26.72	554	25.25	104	15.2	274	30.41	234	40
Age										
14-24	1269	29.08	497	22.65	193	28.22	329	36.51	250	42.74
25-34	1,253	28.71	563	25.66	193	28.22	290	32.19	207	35.38
35-44	664	15.22	360	16.41	117	17.11	129	14.32	58	9.91
45-54	653	14.96	426	19.42	99	14.47	86	9.54	42	7.18
55+	499	11.43	337	15.36	80	11.7	59	6.55	23	3.93
Missing	26	0.6	11	0.5	2	0.29	8	0.89	5	0.85
State										
IA	89	2.04	59	2.69	12	1.75	13	1.44	5	0.85
MN	3,429	78.57	1,703	77.62	523	76.46	693	76.91	510	87.18
NE	17	0.39	7	0.32	0	0	10	1.11	0	0
SD	84	1.92	35	1.6	21	3.07	16	1.78	12	2.05
WI	745	17.07	390	17.78	128	18.71	169	18.76	58	9.91
Claim Type										
Lost time	586	13.43	320	14.59	138	20.18	77	8.55	51	8.72
Med. Only	3,778	86.57	1,874	85.41	546	79.82	824	91.45	534	91.28
Claim Cost*										
$0	601	13.77	336	15.31	74	10.82	125	13.87	66	11.28
<$1000	2,288	52.43	1,126	51.32	313	45.76	490	54.38	359	61.37
$1k-$10k	1,166	26.72	552	25.16	227	33.19	250	27.75	137	23.42
$10k-$25k	146	3.35	83	3.78	31	4.53	21	2.33	11	1.88
$25k-$100k	130	2.98	79	3.6	31	4.53	11	1.22	9	1.54
>$100,000	33	0.76	18	0.82	8	1.17	4	0.44	3	0.51

*Adjusted for inflation to 2017 dollars.

A total of 4,364 claims were reported among group home workers between 2006 and 2017. The median age of injured workers was 31, with almost 30% of injured workers being age 24 or younger. Over 73% of the injured workers in the dataset were female. The majority of claims, at roughly 79%, originated from Minnesota. In total, 34% and 29% of the reported injuries were related to WPV or SPHM activities, respectively. Nearly half of all injuries, at 49.7%, involved some type of contact with a group home resident, whether SPHM or WPV or both. Lost time claims made up roughly 13% of the

total dataset, but 20% of SPHM-only claims. Under 9% of WPV-only claims resulted in lost time. After adjusting all claim costs for inflation to 2017 dollars, one third of all claims incurred a cost of greater than $1000. 43% of SPHM-only claims incurred greater than $1000, while 32% of WPV-only claims incurred greater than $1000. 27% of claims that involved both SPHM and WPV incurred greater than $1000.

Per the WCIO injury classification system, the most common causes of injury were Fellow Worker Or Patient (30%), followed by Falls (17%), Miscellaneous Strain/Injury (6%), and Lifting (6%). Strains (36%), Contusions (28%), Punctures (8%), and Lacerations (7%) were the most common natures of injury. The most affected body parts included Multiple (19%), Low Back (12%), Finger (8%), and Knee (5%).

Table 11. Injury Cause/Nature/Body Part per WCIO coding

Cause	N	Percent
Fellow Worker Or Patient	1,313	30.09%
Falls, all types	752	17.23%
Miscellaneous Strain/Injury	275	6.3%
Lifting	262	6%
Absorpt/Ingest/Inhalation, Noc	165	3.78%
Holding Or Carrying	158	3.62%
All Other	1,439	32.97%
Nature		
Strain	1,566	35.88%
Contusion	1,231	28.21%
Puncture	366	8.39%
Laceration	304	6.97%
Sprain	155	3.55%
Contagious Disease	127	2.91%
All Other	615	14.09%
Body Part		
Multiple	828	18.97%
Low Back	487	11.16%

Finger	337	7.72%
Knee	221	5.06%
Shoulder	184	4.22%
Face Tissue	175	4.01%
All Other	2,132	48.86%

In predicting risk of a lost-time claim, injuries resulting from only SPHM activities had a risk ratio 1.44 (95% CI 1.17-1.77) compared injuries that did not arise from contact with a group home resident, after controlling for worker age, gender, injury year, and employer. Workers who filed an SPHM-only injury claim had a 20% chance of requiring time away from work (95% CI 0.17-0.24). When adjusting for the same covariates to predict risk of lost-time claims, injuries resulting from WPV-only had a risk ratio of 0.67 (95% CI 0.53-0.85) compared to injuries that did not arise from contact with a resident. Workers who filed a WPV-only injury claim had a 9% chance of requiring time away from work (95% CI 0.07-0.11). Claims that were coded as positive for both SPHM and WPV had an RR of 0.71 (95% CI 0.55-0.92) for requiring time away from work compared to non-contact claims. Workers filing these claims had a 10% chance of requiring time off work (95% CI 0.08-0.12). The Type 3 LR p-value associated with the "SPHM*WPV" interaction term was 0.0005.

Table 12. Risk Ratios and Predicted Probabilities of Incurring Lost Time Claim by Injury Type

Injury Type	RR (95% CI)	Predicted Probability (95% CI)
No Contact Involved	1 (ref)	0.14 (0.12-0.16)
SPHM Only	1.44 (1.17-1.77)	0.20 (0.17-0.24)
WPV Only	0.67 (0.53-0.85)	0.09 (0.07-0.11)
SPHM & WPV*	0.71 (0.55-0.92)	0.10 (0.08-0.12)
**Interaction term Type 3 LR p-value = 0.0005*		

Controlling for gender, age group, state, time period, and employer

Claims resulting from SPHM-only injury had an RR of 1.05 (95% CI 1.01-1.08) of incurring a non-zero cost compared to a non-contact claim. Claims resulting from WPV had an RR of 1.02 (95% CI 0.99-1.06) of incurring a non-zero cost compared to a non-contact claim. Claims that were coded positive for both SPHM and WPV had an RR of 1.05 (95% CI 1.01-1.09) of incurring a non-zero cost compared to a non-contact claim. The Type 3 LR p-value associated with the "SPHM*WV" interaction term was 0.031.

Among claims that incurred non-zero costs, the mean cost of SPHM-only claims was 1.51 times (95% CI 1.07-2.13) the mean cost of non-contact claims. The mean cost of WPV-only claims was 0.69 times (95% CI 0.49-0.97) the mean cost of non-contact claims. Claims that were coded positive for both SPHM and WPV had a mean claim cost of 0.97 times (95% CI 0.61-1.47) the mean cost of non-contact claims. The Type 3 LR p-value associated with the "SPHM*WPV" interaction term was 0.013.

DISCUSSION

This analysis reveals that occupational injuries resulting from SPHM and WPV in Upper Midwest group homes are prevalent enough to make up major blocks of the workers' compensation claims data in that industry. Using multiple metrics, injuries resulting from SPHM in group homes were more severe than other group home worker injuries. By these same metrics, injuries resulting from WPV were not more severe than other injuries, though WPV may present delayed or ongoing psychosocial effects and difficulties for workers that are not captured in workers' compensation data, and do not need to arise from a physical altercation to produce these effects[35,38,39]. WPV was also

alarmingly prevalent in the data, playing a role in 1/3 of all recorded claims. Outcomes from claims that were positive for both SPHM and WPV more closely resembled the patterns of WPV-only claims, which were less costly and less likely to result in lost time. This contrast implies not only that traditional, routine SPHM activities take place in group homes (e.g., lifting, repositioning, transferring, toileting, etc.), but that claims that are unambiguously related to these procedures are among the most debilitating and costly that group home workers experience.

Group homes are not currently covered by any state SPHM laws[5]. However, in the final ergonomics rule issued by OSHA in 2000 that was later overturned by congress, an employee requiring time off word for an MSD would act as "action trigger" for the employer's possible regulation under the standard[66]. If certain further screening conditions were met, for example if employees were required to lift more than 75 pounds at any one time, then that employer would be required to implement an ergonomics program and fall under OSHA regulation for those hazards[66]. Based on this analysis, many group home employers represented in this data could easily meet the OSHA requirements for ergonomics regulation, although making definite statements about the OIICS classifications used by the federal government from less-detailed WCIO data would be problematic[64].

Several patterns are apparent in the descriptive demographics associated with researcher-coded injury type. While the overall proportion of women in the claims dataset was roughly 73%, the proportion claims that were positive for SPHM-only activities that were filed by women was nearly 85%. Conversely, just under 70% of the claims that were positive for WPV-only were filed by women, and only 60% of the claims that were

positive for both SPHM and WPV were filed by women. Claimant ages also skew younger in the claims that were coded positively for WPV, whether those claims were also positive for SPHM or not.

While this data does not allow for inferences about the underlying demographics of the group home workforce, these findings suggest that certain tasks may be occupationally segregated by gender and age. The presence of WPV in these claims appears to be associated with younger male workers, indicating that they may be involved in more dangerous situations on the job or are more willing to use restraints. Past research points to inconclusive and conflicting evidence regarding how gender may influence the attitudes or willingness of healthcare workers to perform manual restraints[111]. As restraints both imply disruptive or aggressive behavior and are considered an SPHM activity by MNDLI, claim descriptions that mentioned a restraint were coded positively for both SPHM and WPV.

In general, two main patterns emerged in the coding process for claims that were positive for both SPHM and WPV. First, many involved "restraint", "hold", or a related word, indicating a workers' physical response to a resident's behavior. Second, many claims described acts of violence or aggression that began in the process of a worker performing an SPHM procedure. These claims may involve a resident lashing out in the process of being dressed or transferred, for example, and possibly even end in a manual restraint or hold. The clearest distinction between the two patterns is temporality; some involved the resident's behavior before the SPHM maneuver, and some involved the resident's behavior after the SPHM maneuver. Because a formalized injury coding system like OIICS or WCIO can only accommodate a single cause or event for an entire claim,

they may fail to capture the underlying situation and procedures that led to an injury, focusing instead on the most apparent part of an injured worker's diagnosis. When possible, researchers of complex topics like WPV should access as detailed information as possible regarding these incidents.

The WCIO coding system may be responsible for some misclassification and underreporting of SPHM and WPV in workers' compensation data. Neither OIICS nor WCIO has an official definition for an SPHM injury[32]. Unlike OIICS, which has a more detailed hierarchical structure, WCIO has no specific set of code trees for WPV[64]. Based on the WCIO codes, only 30% of claims in this dataset had a cause of "Fellow worker/patient", which would be a key indicator of either SPHM or WPV in research without accompanying free text descriptions. However, the results of the narrative text coding indicated that almost half of all claims involved a group home resident. Other causes, including "Miscellaneous Strain/Injury", "Lifting", and "Holding or Carrying" may comprise some of the differential between the WCIO and researcher-produced codes.

It is important to recognize that WPV can take many forms and is regularly underreported in healthcare settings[18,19]. Crucially, many states lag behind in workers' compensation coverage for psychological harm with no accompanying physical injury[20]. Therefore, there were likely many instances of verbal threats, abuse, or harassment that resulted in psychological harm but were not present in this workers' compensation data that spans several states. Research has suggested that WPV in the form of verbal harassment without an accompanying physical injury can have even greater long-term harmful effects, or result in longer time away from work, than WPV in the form of

physical injury[35,93]. The ability to detect this long-term harm in workers' compensation data depends on the rules of each given state, which is why survey-based and qualitative research is valuable in this area[35,112].

Table 13. Risk Ratios of Incurring Non-Zero Cost, Ratio of Mean Costs (RoM) Among Cost-Incurring Claims, and Median Claim Costs by Contact Injury Type

Injury Type	RR (95% CI)	RoM (95% CI)	Median Claim Cost
No Contact Involved	1 (ref)	1 (ref)	$453
SPHM Only	1.04 (1.01-1.08)	1.51 (1.07-2.13)	$763
WPV Only	1.01 (0.98-1.05)	0.69 (0.49-0.97)	$459
SPHM & WPV	1.05* (1.02-1.09)	0.95** (0.61-1.47)	$456

**Interaction term Type 3 LR p-value = 0.0311*
***Interaction term Type 3 LR p-value = 0.0133*
Controlling for gender, age group, state, time period, and employer. Costs adjusted for inflation to 2017 dollars.

Limitations

This analysis allowed for an in-depth investigation of occupational injury in group homes, an understudied setting in occupational health, but had several limitations. First, the data originated from an insurance provider that serves only a portion of group homes in the region. It is impossible to know what factors may contribute to inclusion in the customer base of this provider. Group homes exist to perform a variety of services for a wide array of individuals, and although we used GEE to adjust for correlation by employer, we have no information on the exact services of any one employer or how they varied between employers. Similarly, there was no information on the population of workers-at-risk for these employers, preventing us from calculating injury rates. Instead, this analysis focused on the risk of severe injury among injured workers.

Workers' compensation data has some advantages over other types of data used for injury surveillance but suffers from certain filters as well[102,113]. Information on race and immigration status was not available in this data, identity categories that shape much of the experience of direct and long-term care work[7]. Language barriers, which may affect much of the group home and nursing assistant workforce, can limit the ability of immigrant workers in filing a workers' compensation claim[114]. Data on pre-injury wages, part-time vs full-time status, and other potentially useful population characteristics were not available. Workers' compensation is also limited in its ability to capture psychological harm from non-physical injury, which is a significant barrier for research on WPV in healthcare[20].

While this study had the advantage of accessing narrative incident descriptions for each claim, a rich source of information, it is possible that coding misclassification occurred. The boundary between SPHM and WPV can be ambiguous, which is why we felt it was important to include the interaction category that encapsulated both. In order to reduce misclassification bias as much as possible, multiple coders reviewed each claim and ambiguous claims were discussed until consensus was reached.

CONCLUSION

This is the first study we know of to focus specifically on SPHM and WPV in group homes using objective, administrative injury data. Group home workers are at high risk for injury resulting from SPHM and WPV. These injuries, especially those associated with traditional SPHM maneuvers like lifting, repositioning, and fall prevention, may be costly and debilitating. WPV injuries in group homes are alarmingly prevalent and can take many forms, causing significant and lasting harm. Both types of injury are

vulnerable to misclassification and underreporting, especially in less-studied occupational settings. In occupational injury prevention policy, interventions that target healthcare workers should consider a broader definition of healthcare to include residential mental health and addiction facilities, which may involve less complex medical care but share many of the same hazards as more traditional healthcare settings

Chapter 5: Conclusion

In Aim 1, we performed a legal assessment of all state-level SPHM laws, capturing the variations in their scope and requirements. Between 2006 and 2023, eleven states (22%) enacted SPHM regulations. Two states, Missouri and Ohio, repealed their SPHM laws in that time frame. In general, the scope of these SPHM laws favored higher acuity settings over lower acuity and residential settings, with every state's law covering workers in general hospitals. Skilled nursing facilities were covered by eight of the eleven states, and retirement/assisted living communities were covered by only one state. No state laws covered group homes.

Using the industrial hygiene framework of the hierarchy of controls, state laws favored lower-cost administrative controls over higher-cost engineering controls. Popular administrative controls (in >60% of states) included safety training, joint labor/management SPHM committees, and hazard assessments. Less-common engineering controls (in <25% of states) included the requirement to purchase SPHM equipment and the requirement to modify future construction plans so facilities can physically support SPHM equipment. Lift teams, a highly valued intervention with a moderate presence in state SPHM laws, incorporate elements of both engineering and administrative controls but ultimately are intended to isolate SPHM hazards within a specialized unit of workers[86].

Eight of the eleven states enacted their policies as requirements for healthcare facility licensing, while Minnesota and California enacted workplace safety standards as part of their state OSHA plans. Ohio's policy was included in its state workers'

compensation laws. Ohio and Minnesota's laws shared an element of public investment in SPHM interventions, enabling healthcare facilities to apply for financial support in purchasing SPHM equipment and enacting SPHM programs. These interventions have shown promise and likely increase the utilization of higher-cost, higher-effectiveness engineering controls in workplaces[84].

Given the variation in state-level policies, what they require, and which workers they cover, researchers should use caution when interpreting SPHM injury trends across states. Although a national survey reported that the presence of a state SPHM policy alone was shown to influence lift, that research focused on very specific hospital units[26]. Future research could test for SPHM practices and injury reductions in more types of units and facilities, and possibly use this project's legal assessment to expand the "SPHM legislation" covariate from a binary variable to a multilevel one.

In Aim 2, we used a statewide workers' compensation database to evaluate the Minnesota Safe Patient Handling Act's effectiveness in reducing SPHM and WPV injury rates among healthcare workers. As revealed in Aim 1, Minnesota covers one of the broadest sets of workers of any state SPHM law. Indemnity claim rates for workers aggregated by their coverage under the policy were compared to indemnity claim rates for healthcare-related workers that were excluded by the policy using negative binomial regression. A pre-law time period was used to establish a reference baseline rate, with rate ratios calculated for future time periods to model the percent change of injury rate over time. This process was repeated for each industry in the analysis individually. Underlying denominators of workers-at-risk were calculated with a combination of the federal QWI and OEWS labor data sources. Using this employment data, both numerator and

denominator data were adjusted to reflect only workers in direct care roles that were most at risk for SPHM-related injury, or Type 2 WPV during care duties.

Our study determined that when workers were aggregated by their coverage under the policy, covered workers saw greater reductions of MSDs, broadly-defined SPHM injury, and narrowly-defined SPHM injury than workers not covered by the policy. However, covered workers did see greater relative increases in rates of WPV. The relative reduction in broadly-defined SPHM injury (35% vs 24%) was the only statistically significant reduction, but the pattern of greater injury reductions among workers covered by the policies can be seen in the point estimates for all non-WPV injury rates. In the most striking example of the analysis by industry, the narrowly-defined SPHM injury rate in policy-covered skilled nursing facilities dropped by 50% from 7.5 to 3.7 per 1000 workers, while the same injuries in policy-excluded retirement communities fell by only 27% from 3.7 to 2.7 per 1000 workers. Consistent with wider national trends, occupational injury rates are falling in healthcare are falling in general, but this research contributes to evidence that state SPHM policies can help hasten this decline[115].

However, this analysis also had concerning findings. Hospitals alone did not see reductions in SPHM injury as definitive as some industries that were not covered by the policy, including group homes and home healthcare. WPV rates in healthcare were shown to grow rapidly even before the Covid-19 pandemic, especially in hospitals, which appear to be major sites of WPV among workers that were covered by the SPHM policy. Group homes, despite not seeing as large an increase as hospitals, instead displayed consistently high rates of WPV, with a rate of 2.6 per 1000 workers in 2014-2019. Group homes were

ranked as the number one industry of concern for WPV in this study's prevention index, mirroring findings from a study of Ohio's statewide workers' compensation data[64].

In Aim 3, group homes were used as an industry case study to further explore the relationship between WPV and SPHM in long term residential care. Narrative incident descriptions in workers' compensation data from a private insurer were coded for injuries related to SPHM, WPV, or both. Log binomial and log linear regressions with GEE were used to analyze the relative severity of claims involving worker contact with residents compared to claims that did not involve contact. The main outcomes of the analysis were risk of incurring a lost-time claim as opposed to a medical-only claim, and mean claim cost using a ratio of means (RoM).

Claims that were associated with SPHM-only injuries, meaning traditional SPHM activities such as lifting and physically assisting group home residents without evidence of aggression of violence, were by both measures more severe than other claims. SPHM-only claims were 1.4 times as likely as claims that did not involve patient-resident contact to result in lost time, were more likely to incur a monetary cost, and had a mean cost that was 51% greater than the mean cost of non-contact claims. Conversely, by these same measures, WPV-only injuries appeared on average less severe, being less likely to result in lost time and incurring a lower mean cost than non-contact claims. Claims that were coded for both SPHM and WPV, which often meant a restraint was used or that aggressive behaviors began during an SPHM activity, were by the available measures less severe than SPHM-only injuries and had outcomes that more closely resembled WPV-only or non-contact claims. It is important to note that "severe" in this context only refers to the ability of workers' compensation data to record and respond to physical injury

associated with these incidents. The long-term and debilitating effects of WPV, and its underreporting in workers' compensation data, have been well documented in healthcare[20,35,39].

Several observations can be made when juxtaposing Aim 2 and Aim 3. First, one of the implications of Aim 3 is that because WPV can take many physical forms, including relatively superficial injuries such as bites, scratches, and slaps, they are more far more likely to be a medical-only claim than an MSD caused by overexertion, which may require a long physical recovery time. Therefore, because Aim 2 is only an analysis of lost-time claims, it most likely presents an even more significant undercount of WPV than Aim 3, which also incorporates medical-only claims. If the lost-time/medical-only proportions from Aim 3 can be generalized to other healthcare-related settings, then the thousands of WPV claims captured in Aim 2 could capture as little as 9% of all reported WPV claims, not counting unreported or psychological injuries rejected by the workers' compensation system. Second, Aim 3 illuminates the ambiguity of SPHM and WPV injury surveillance in healthcare, given that a sizeable proportion of claims involved elements of both. When possible, researchers of WPV in healthcare should attempt to access as detailed data as possible to allow for this complexity.

A common theme through the findings of all three aims is injury reduction in healthcare will continue to face challenges despite the intentions of policy. In preparing background research, the issue of safe staffing levels became increasingly apparent as a limiting factor for injury reduction. Safe staffing levels in healthcare have been reported as necessary for adherence to SPHM policy, for avoiding the need for restraints, for reducing WPV and worker turnover, and in achieving better patient outcomes[30,34,79,86-88].

The present study can help inform how future policy innovations can strengthen existing ones and achieve multiple goals in healthcare worker injury reduction.

Bibliography

1. Bureau USC. Quarterly Workforce Indicators (1990-2021). In. Washington, DC: U.S. Census Bureau, Longitudinal-Employer Household Dynamics Program; 2022.
2. Statistics UBoL. Table R6. Incidence rates for nonfatal occupational injuries and illnesses involving days away from work, restricted activity, or job transfer (DART), days away from work (DAFW), and days of restricted work activity, or job transfer (DJTR) per 10,000 full-time workers by industry and selected parts of body affected by injury or illness, private industry, 2021-2022. In: Illnesses SoOIa, ed. Washington, DC: US Bureau of Labor Statistics; 2023.
3. Statistics UBoL. Occupational injuries and illnesses resulting in musculoskeletal disorders (MSDs). 2018; https://www.bls.gov/iif/factsheets/msds.htm. Accessed 3/28/2024.
4. Gomaa AE, Tapp LC, Luckhaupt SE, et al. Occupational Traumatic Injuries Among Workers in Health Care Facilities — United States, 2012–2014. *Morbidity and Mortality Weekly Report.* 2015;64(15):405-410.
5. Wrightson KL, Taylor; Harley, Susan; Sanoian, Brett. *Uplifting an Industry?: State-Based Safe Patient Handling Laws Have Yielded Improvements But Are Not Adequately Protecting Health Care Workers.* Washington, DC: Public Citizen; June 25, 2015 2015.
6. Statistics UBoL. Fact Sheet | Workplace Violence in Healthcare, 2018 | April 2020. 2018; https://www.bls.gov/iif/factsheets/workplace-violence-healthcare-2018.htm. Accessed 3/28/2024.
7. Dill J, Duffy M. Structural Racism And Black Women's Employment In The US Health Care Sector. *Health Aff (Millwood).* 2022;41(2):265-272.
8. Nelson A, Baptiste AS. Evidence-based practices for safe patient handling and movement. *Online journal of issues in nursing.* 2004;9(3):4.
9. Weinmeyer R. Safe Patient Handling Laws and Programs for Health Care Workers. *AMA journal of ethics.* 2016;18(4):416-421.
10. Minnesota Safe Patient Handling Act, 182.6551 to 182.6554 Minnesota Legislature, §182.6551 to 182.6554 (2007).
11. May 2023 State Occupational Employment and Wage Estimates - Minnesota. In: US Bureau of Labor Statistics OEaWSO, ed2023.
12. Dill J, Morgan JC, Van Heuvelen J, Gingold M. Professional certification and earnings of health care workers in low social closure occupations. *Soc Sci Med.* 2022;303:115000.

13. Frogner BK, Dill JS. Tracking Turnover Among Health Care Workers During the COVID-19 Pandemic: A Cross-sectional Study. *JAMA Health Forum.* 2022;3(4):e220371.

14. Keith MM, Brophy JT. *Code White: Sounding the Alarm on Violence Against Healthcare Workers.* Between the Lines; 2021.

15. Rosebush CE, Zaidman B, Schofield KE, et al. Occupational differences in workers' compensation indemnity claims among direct care workers in Minnesota nursing homes, 2005-2016. *Am J Ind Med.* 2020;63(6):517-526.

16. Statistics UBoL. TABLE R12. Number of nonfatal occupational injuries and illnesses involving days away from work, restricted activity, or job transfer (DART), days away from work (DAFW), and days of restricted work activity, or job transfer (DJTR) by occupation and selected events or exposures leading to injury or illness, private industry, 2021-2022. In: Illnesses SoOIa, ed. Washington, DC: US Bureau of Labor Statistics; 2023.

17. May 2023 National Occupational Employment and Wage Estimates. In: US Bureau of Labor Statistics OEaWSO, ed2023.

18. Small TF. Underreporting Workplace Violence in Home Care. *Home Healthc Now.* 2020;38(5):281.

19. Byon HD, Sagherian K, Kim Y, Lipscomb J, Crandall M, Steege L. Nurses' Experience With Type II Workplace Violence and Underreporting During the COVID-19 Pandemic. *Workplace Health Saf.* 2022;70(9):412-420.

20. Wise EA, Beck JG. Work-Related Trauma, PTSD, and Workers Compensation Legislation: Implications for Practice and Policy. *Psychological trauma.* 2015;7(5):500-506.

21. Howatt G. Lacking workers, group home capacity shrinks: Number of licenses in Minnesota fall for the first time since 2019. *Star Tribune.* 03/03/

2022 Mar 03, 2022.

22. Thomas DR, Thomas YLN. Interventions to reduce injuries when transferring patients: A critical appraisal of reviews and a realist synthesis. *International journal of nursing studies.* 2014;51(10):1381-1394.

23. Burris SC. A Technical Guide for Policy Surveillance. *Temple University Legal Studies Research.* 2014.

24. Teeple E, Collins JE, Shrestha S, Dennerlein JT, Losina E, Katz JN. Outcomes of safe patient handling and mobilization programs: A meta-analysis. *Work.* 2017;58(2):173-184.

25. Gold JE, Punnett L, Gore RJ. Predictors of low back pain in nursing home workers after implementation of a safe resident handling programme. *Occup Environ Med.* 2017;74(6):389-395.

26. Kayser SA, Wiggermann NE, Kumpar D. Factors associated with safe patient handling practice in acute care and its relationship with patient mobilization: A cross-sectional study. *International Journal of Nursing Studies.* 2020;104:103508.

27. Lee S, Lee JH, Harrison R. Safe patient handling legislation and musculoskeletal disorders among California healthcare workers: Analysis of workers' compensation data, 2007вЂ“2016. *American journal of industrial medicine.* 2022;65(7):589-603.

28. Silverstein B, Howard N, Adams D. Does Safe Patient Handling Legislation Make a Difference. *Work (Reading, Mass).* 2012;41(1):6153-6155.

29. Lee SJ, Kang KJ, Lee JH. Safe patient handling legislation and changes in programs, practices, perceptions, and experience of musculoskeletal disorders by hospital characteristics: A repeated cross-sectional survey study. *Int J Nurs Stud.* 2021;113:103791.

30. Lee S-J, Stock L, Michalchuk V, Adesoye K, Mullen K. Impact of California Safe Patient Handling Legislation: Health Care WorkersвЂ™ Perspectives. *Workplace Health Saf.* 2021;69(3):124-133.

31. Rosebush CE, Schofield KE, Ramirez M, et al. Differential effectiveness of the Minnesota Safe Patient Handling Act by health care setting: An exploratory study. *Am J Ind Med.* 2022;65(2):105-116.

32. Rosebush CE, Zaidman B, Schofield KE, et al. Evaluation of the Minnesota Safe Patient Handling Act: trends in workers' compensation indemnity claims in nursing home workers before and after enactment of the law. *Occup Environ Med.* 2021;78(1):22-28.

33. Galinsky T, Feng HA, Streit J, et al. Risk Factors Associated with Patient Assaults of Home Healthcare Workers. *Rehabilitation nursing.* 2010;35(5):206-215.

34. Noble NL, Sweeney NL. Barriers to the Use of Assistive Devices in Patient Handling. *Workplace Health Saf.* 2018;66(1):41-48.

35. Gerberich SG, Church TR, McGovern PM, et al. An epidemiological study of the magnitude and consequences of work related violence: the Minnesota Nurses' Study. *Occup Environ Med.* 2004;61(6):495-503.

36. Nachreiner NM, Hansen HE, Okano A, et al. Difference in work-related violence by nurse license type. *J Prof Nurs.* 2007;23(5):290-300.

37. Odes R, Lee SJ, Hong O, Jun J. The effect of COVID-19 on workplace violence in California's hospitals: An interrupted time series analysis. *J Adv Nurs.* 2023;79(6):2337-2347.

38. Stafford S, Avsar P, Nugent L, et al. What is the impact of patient violence in the emergency department on emergency nurses' intention to leave? *J Nurs Manag.* 2022;30(6):1852-1860.

39. Andersen LP, Hogh A, Elklit A, Andersen JH, Biering K. Work-related threats and violence and post-traumatic symptoms in four high-risk occupations: short- and long-term symptoms. *Int Arch Occup Environ Health.* 2019;92(2):195-208.

40. Byon HD, Liu X, Crandall M, Lipscomb J. Understanding Reporting of Type II Workplace Violence Among Home Health Care Nurses. *Workplace Health Saf.* 2020;68(9):415-421.

41. Bush AM, Reichard AA, Wurzelbacher SJ, Tseng CY, Lampl MP. Workers' compensation claims among private skilled nursing facilities, Ohio, 2001-2012. *Am J Ind Med.* 2020;63(12):1155-1168.

42. Hewko SJ, Cooper SL, Huynh H, et al. Invisible no more: a scoping review of the health care aide workforce literature. *BMC Nurs.* 2015;14:38.

43. Jacobson JW, Janicki MP. Clinical need variations of disabled persons residing in group homes. *J Community Psychol.* 1985;13(1):54-66.

44. Grant HJ, Pickett W, Lam M, O'Connor M, Ouellette-Kuntz H. Falls among persons who have developmental disabilities in institutional and group home settings. *Journal on Developmental Disabilities.* 2001;8(1):57-73.

45. Bigby C, Knox M, Beadle-Brown J, Bould E. Identifying good group homes: qualitative indicators using a quality of life framework. *Intellect Dev Disabil.* 2014;52(5):348-366.

46. Oman RF, Vesely SK, Green J, Fluhr J, Williams J. Short-Term Impact of a Teen Pregnancy-Prevention Intervention Implemented in Group Homes. *J Adolesc Health.* 2016;59(5):584-591.

47. Farmer EM, Wagner HR, Burns BJ, Murray M. Who Goes Where? Exploring Factors Related to Placement Among Group Homes. *J Emot Behav Disord.* 2016;24(1):54-63.

48. Shipton L, Lashewicz BM. Quality Group Home Care for Adults with Developmental Disabilities and/or Mental Health Disorders: Yearning for Understanding, Security and Freedom. *J Appl Res Intellect Disabil.* 2017;30(5):946-957.

49. Farmer EMZ, Seifert H, Wagner HR, Burns BJ, Murray M. Does Model Matter? Examining Change Across Time for Youth in Group Homes. *J Emot Behav Disord.* 2017;25(2):119-128.

50. Oman RF, Vesely SK, Clements-Nolle K, Fluhr J. Adolescent Pregnancy Prevention in Group Homes: Recruiting and Retention Considerations. *Am J Public Health.* 2018;108(S1):S9-s10.

51. Landes SD, Turk MA, Formica MK, McDonald KE, Stevens JD. COVID-19 outcomes among people with intellectual and developmental disability living in residential group homes in New York State. *Disabil Health J.* 2020;13(4):100969.

52. Laxton P, Patterson F, Healy S. Factors Related to Physical Activity in Adults With Intellectual Disabilities in Group Home Settings: A Systematic Literature Review. *Adapt Phys Activ Q.* 2023;40(2):347-377.

53. Yaglom HD, Gebhardt M, Pfeiffer A, et al. Applying Genomic Epidemiology to Characterize a COVID-19 Outbreak in a Developmentally Disabled Adult Group Home Setting, Arizona. *Front Public Health.* 2021;9:668214.

54. Driscoll NM, Rothschild AW, Luiselli JK, et al. Brief Report: A Pilot Investigation of Safety Concerns Among Direct Service Providers for Adults with Intellectual and Developmental Disabilities. *J Dev Phys Disabil.* 2022:1-8.

55. Hirsch KM, Reidenberg BE. COVID-19 vaccine effectiveness in adults with developmental disabilities living in group homes. *Public Health.* 2022;209:e3-e4.

56. Howey W, Assadollahi A, Lundahl B. Group Homes and COVID-19: Perspectives of Youth Residents, Staff, and Caregivers. *Int J Environ Res Public Health.* 2022;19(15).

57. Rothschild AW, Ricciardi JN, Luiselli JK, et al. Organizational Responsiveness to the COVID-19 Pandemic: a Mixed Methods Social Validity Assessment of Human Services Care Providers. *Adv Neurodev Disord.* 2022;6(3):349-359.

58. Hung L, Yang SC, Guo E, et al. Staff experience of a Canadian long-term care home during a COVID-19 outbreak: a qualitative study. *BMC Nurs.* 2022;21(1):45.

59. Donelan K, Wolfe J, Wilson A, et al. Group Home Staff Experiences With Work and Health in the COVID-19 Pandemic in Massachusetts. *JAMA Health Forum.* 2023;4(4):e230445.

60. Levison JH, Krane D, Donelan K, et al. Best practices to reduce COVID-19 in group homes for individuals with serious mental illness and intellectual and developmental disabilities: Protocol for a hybrid type 1 effectiveness-implementation cluster randomized trial. *Contemp Clin Trials.* 2023;125:107053.

61. Risma KM, Weber-Gasparoni K, Swenson SE, Ettinger RL, Qian F. Group home caregivers' comfort levels regarding physical resistance during oral hygiene care. *Spec Care Dentist.* 2015;35(3):123-131.

62. Umb Carlsson Õ. Health-promotion intervention in a group home: Perspectives of residents, staff and rehabilitation professionals. *J Intellect Disabil.* 2021;25(2):210-229.

63. McMaughan DJD, Halphen JM, Velky P, Burnett J, Drake SA. Victimization in Unethical Unlicensed Small Residential Care Homes in the United States: The Case for Whole System Disruption. *J Aging Soc Policy.* 2023:1-17.

64. Wurzelbacher SJ, Meyers AR, Lampl MP, et al. Workers' compensation claim counts and rates by injury event/exposure among state-insured private employers in Ohio, 2007–2017. *Journal of Safety Research.* 2021;79:148-167.

65. Dickerson D, Gruden M, Duck J, et al. Beyond getting started: A resource guide for implementing a safe patient handling program in the acute care setting. 2006.

66. Administration OSaH. Ergonomics Program Final Rule. In: OSHA, ed. *Federal Register - 65 FR 68261.* Vol 1218-AB36. Washington, DC2000:68261-68870.

67. Waters TR. When is it safe to manually lift a patient? *The American journal of nursing.* 2007;107(8):53-58.

68. Gold JE, Punnett L, Gore RJ. Predictors of low back pain in nursing home workers after implementation of a safe resident handling programme. *Occupational and environmental medicine (London, England).* 2017;74(6):389-395.

69. Burris S, Hitchcock L, Ibrahim J, Penn M, Ramanathan T. Policy Surveillance: A Vital Public Health Practice Comes of Age. *Journal of health politics, policy and law.* 2016;41(6):1151-1173.

70. Skuster P, Menzel J, Ghorashi AR, Perkins M. Policy surveillance for a global analysis of national abortion laws. *Sexual and reproductive health matters.* 2022;30(1):2064208-2064208.

71. Nau T, Bellew W, Giles-Corti B, Bauman A, Smith BJ. The Built Environment and Population Physical Activity: Methods for Mapping the Relevant Laws. *Journal of physical activity & health.* 2023;20(2):157-168.

72. Brewer TW, Bonnah GK, Cairns JS, Lanese BG, Waimberg J. Medicaid Coverage for Podiatric Care: A National Survey. *Public Health Rep.* 2023;138(2):273-280.

73. Cloud LK, Prood N, Ibrahim J. Disarming Intimate Partner Violence Offenders: An In-Depth Descriptive Analysis of Federal and State Firearm Prohibitor Laws in the United States, 1991–2016. *Journal of Interpersonal Violence.* 2023;38(5-6):5164-5189.

74. Platt E, Moran-McCabe K, Cook A, Burris S. Trends in US State Public Health Emergency Laws, 2021–2022. *Am J Public Health.* 2023;113(3):288-296.

75. Moran-McCabe K, Waimberg J, Ghorashi A. Mapping Housing Laws in the United States: A Resource for Evaluating Housing Policies' Impacts on Health. *Journal of Public Health Management and Practice.* 2020;26:S29-S36.

76. Fernández-Viña MH, Prood NE, Herpolsheimer A, Waimberg J, Burris S. State Laws Governing Syringe Services Programs and Participant Syringe Possession, 2014-2019. *Public Health Rep.* 2020;135(1_suppl):128s-137s.

77. Jones BS, Daniel S, Cloud LK. State Law Approaches to Facility Regulation of Abortion and Other Office Interventions. *Am J Public Health.* 2018;108(4):486-492.

78. Rice T, Rosenau P, Unruh LY, Barnes AJ. United States: Health System Review. *Health Syst Transit.* 2020;22(4):1-441.

79. de Vries N, Boone A, Godderis L, et al. The Race to Retain Healthcare Workers: A Systematic Review on Factors that Impact Retention of Nurses and Physicians in Hospitals. *Inquiry.* 2023;60:469580231159318.

80. Administration OSaH. Safe Patient Handling Program Checklist. In: Labor Do, ed. Washington, DC.

81. Lapane KL, Dubé CE, Jesdale BM. WORKER INJURIES IN NURSING HOMES: IS SAFE PATIENT HANDLING LEGISLATION THE SOLUTION? *J Nurs Home Res Sci.* 2016;2:110-117.

82. Oba DO. *Safe Patient Handling - A Case for National Legislation*. Houston, TX: School of Public Health, The Univeristy of Texas School of Public Health; 2020.

83. House Concurrent Resolution No. 16: "Requesting Appropriate Safegaurds be Instituted in Health Care Facilities to Minimize the Occurrence of Musculoskeletal Injuries Suffered by Nurses.", H.C.R. No. 16(2006).

84. Wurzelbacher SJ, Bertke SJ, Lampl MP, et al. The effectiveness of insurer-supported safety and health engineering controls in reducing workers' compensation claims and costs. *American Journal of Industrial Medicine.* 2014;57(12):1398-1412.

85. Morris GA, Cannady R. Proper Use of the Hierarchy of Controls. *Professional safety.* 2019;64(8):37-40.

86. Schoenfisch AL, Lipscomb HJ, Myers DJ, Fricklas E, James T. A lift assist team in an acute care hospital-prevention of injury or transfer of risk during patient-handling tasks? *Aaohn J.* 2011;59(8):329-334.

87. Griffiths P, Maruotti A, Recio Saucedo A, et al. Nurse staffing, nursing assistants and hospital mortality: retrospective longitudinal cohort study. *BMJ Qual Saf.* 2019;28(8):609-617.

88. McKeown M, Thomson G, Scholes A, et al. "Catching your tail and firefighting": The impact of staffing levels on restraint minimization efforts. *J Psychiatr Ment Health Nurs.* 2019;26(5-6):131-141.

89. Minnesoa Ergonomics Standard, 182.677 ERGONOMICS (2023).

90. Statistics UBoL. TABLE 1. Incidence rates of nonfatal occupational injuries and illnesses by industry and case types, 2022. *Survey of Occupational Injuries and Illnesses (SOII)* 2023; https://www.bls.gov/iif/nonfatal-injuries-and-illnesses-tables/table-1-injury-and-illness-rates-by-industry-2022-national.htm#soii_n17_as_t1.f.1.

91. Lax M, Zoeckler J, Goessling K, Greetham S. *New York State's Safe Patient Handling Law: A step forward for workers' safety and health?* Syracuse, NY: Occupational Health Clinical Center; 4/26/2019 2019.

92. Congress t. H.R.1195 - Workplace Violence Prevention for Health Care and Social Service Workers Act. In: Congress U, ed. *H.R.1195*. Washington, DC2021.

93. Wizner K, Cunningham K, Gaspar FW, Dewa CS, Grunert B. Occupational posttraumatic stress disorder and workplace violence in workers' compensation claims. *Journal of Traumatic Stress.* 2022;35(5):1368-1380.

94. Galizzi M, Miesmaa P, Punnett L, Slatin C. Injured Workers' Underreporting in the Health Care Industry: An Analysis Using Quantitative, Qualitative, and Observational Data. *Ind Relat (Berkeley).* 2010;49(1):22-43.

95. Statistics USBoL. BLS OSH Definitions. In. Washington, DC2023.

96. Statistics BoL. Occupational Injury and Illness Classification Systems (OIICS). In: Labor USDo, ed. Washington, DC2012.

97. Bonauto D, Silverstein B, Adams D, Foley M. Prioritizing Industries for Occupational Injury and Illness Prevention and Research, Washington State Workers' Compensation Claims, 1999-2003. *Journal of occupational and environmental medicine.* 2006;48(8):840-851.

98. Anderson NJ, Bonauto DK, Adams D. Prioritizing industries for occupational injury prevention and research in the Services Sector in Washington State, 2002-2010. *Journal of occupational medicine and toxicology (London, England).* 2014;9(1):37-37.

99. Yang L, Branscum A, Bovbjerg V, Cude C, Weston C, Kincl L. Assessing disabling and non-disabling injuries and illnesses using accepted workers compensation claims data to prioritize industries of high risk for Oregon young workers. *Journal of safety research.* 2021;77:241-254.

100. Howard NL, Adams D, Marcum J, Cole J. An Examination of Washington State Workers' Compensation Claims for Home-Based Health Care Workers, 2006 to 2016: Part 2. Injury Rates and Trends. *Home Health Care Management & Practice.* 2022;34(3):202-213.

101. Lee S-J, Yun Y, Hwang J, Jong S. Impact of COVID-19 on occupational injuries and illnesses among nursing care facility workers: Analysis of California workers' compensation data, 2019–2021. *American journal of industrial medicine.* 2023;66(11):965-976.

102. Azaroff LS, Levenstein C, Wegman DH. Occupational Injury and Illness Surveillance: Conceptual Filters Explain Underreporting. *American journal of public health (1971).* 2002;92(9):1421-1429.

103. De Schryver A, Cornelis K, Van Winckel M, et al. The occupational risk of Helicobacter pylori infection among workers in institutions for people with intellectual disability. *Occup Environ Med.* 2008;65(9):587-591.

104. Dill J, Frogner B, Travers J. Taking the Long View: Understanding the Rate of Second Job Holding Among Long-Term Care Workers. *Med Care Res Rev.* 2022;79(6):844-850.

105. Guerin RJ, Reichard AA, Derk S, Hendricks KJ, Menger-Ogle LM, Okun AH. Nonfatal Occupational Injuries to Younger Workers - United States, 2012-2018. *MMWR Morb Mortal Wkly Rep.* 2020;69(35):1204-1209.

106. Statistics UBoL. Industries at a Glance - Nursing and Residential Care Facilities: NAICS 623. 2023; https://www.bls.gov/iag/tgs/iag623.htm. Accessed 8/25/2023, 2023.

107. Frogner BK, Dill JS. Tracking Turnover among Health Care Workers during the COVID-19 Pandemic: A Cross-sectional Study. *JAMA health forum.* 2022;3(4):E220371-e220371.

108. Association AN. Worplace Violence. 2021; https://www.nursingworld.org/practice-policy/advocacy/state/workplace-violence2/. Accessed 9/20/2022, 2022.

109. Amirsadri A, Pizzuti A, Smith D, Duckett D, Arfken CL. Training for Direct Support Staff at Group Homes for People with Chronic Mental Illness. *Community Ment Health J.* 2018;54(1):54-57.

110. Deb P, Norton EC. Modeling Health Care Expenditures and Use. *Annual review of public health.* 2018;39:489-505.

111. Wong WK, Bressington DT. Nurses' attitudes towards the use of physical restraint in psychiatric care: A systematic review of qualitative and quantitative studies. *Journal of psychiatric and mental health nursing.* 2022;29(5):659-675.

112. Pompeii LA, Schoenfisch AL, Lipscomb HJ, Dement JM, Smith CD, Upadhyaya M. Physical assault, physical threat, and verbal abuse perpetrated against hospital workers by patients or visitors in six U.S. hospitals. *American Journal of Industrial Medicine.* 2015;58(11):1194-1204.

113. Wuellner SE, Adams DA, Bonauto DK. WorkersвЂ™ compensation claims not reported in the Survey of Occupational Injuries and Illnesses: Injury and claim characteristics. *American journal of industrial medicine.* 2017;60(3):264-275.

114. Premji S, Begum M, Medley A. Systemic barriers to reporting work injuries and illnesses in contexts of language barriers. *American journal of industrial medicine.* 2023;66(2):122-131.

115. Lundstrom EW, Hendricks SA, Marsh SM, Groth CP, Smith GS, Bhandari R. Temporal trends in occupational injuries treated in US emergency departments, 2012-2019. *Inj Epidemiol.* 2023;10(1):13.

Appendix

Supplemental Table 1. Final Coding Protocol (Aim 1)

Question 1:	**Does the state have a specific policy in place to protect healthcare or social assistance workers from hazards posed by physically handling or assisting patients/clients?**
Question Type:	Binary - mutually exclusive
Variable Name 1:	**SPHM reg**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 1.1:	**What type of policy exists for this state?**
Question Type:	Categorical - check all that apply
Variable Name 1.1(A):	**type_Statute**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 1.1(B):	**type_Regulation**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 1.1(C):	**type_Standard**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 1.1(D):	**type_Other**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 2:	**What state agency is tasked with enacting this policy?**
Question Type:	Categorical - mutually exclusive
Variable Name 2:	**Agency**
Variable Values:	0, 1, 2
Value Label:	0 = Labor

Value Label:	1 = Health/Human Services
Value Label:	2 = Other
Question 3:	**What sector does this policy cover?**
Question Type:	Categorical - mutually exclusive
Variable Name 3:	**sector**
Variable Values:	0, 1, 2
Value Label:	0 = Public sector
Value Label:	1 = Private Sector
Value Label:	2 = Both
Question 4:	**What settings/industries are covered by this policy?**
Question Type:	Categorical - check all that apply
Variable Name 4(A):	**Setting/Industry_621493 Freestanding Ambulatory Surgical and Emergency Centers**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 4(B):	**Setting/Industry_621610 Home Health Care Services**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 4(C):	**Setting/Industry_6214 Outpatient Care Centers**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 4(D):	**Setting/Industry_622110 General Medical and Surgical Hospitals**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 4(E):	**Setting/Industry_622210 Psychiatric and Substance Abuse Hospital**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 4(F):	**Setting/Industry_622310 Specialty (except Psychiatric and Substance**
Variable Values:	0, 1
Value Label:	0 = No

Value Label:	1 = Yes
Variable Name 4(G):	**Setting/Industry_ 623110 Nursing Care Facilities (Skilled Nursing Facilities)**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 4(H):	**Setting/Industry_6232 Group Homes**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 4(I):	**Setting/Industry_6233 Retirement Communities and Assisted Living**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 4(J):	**Setting/Industry_Other**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 5:	**Does the policy require a hazard assessment that considers the specific patient handling needs of the patient population?**
Question Type:	Binary - mutually exclusive
Variable Name 5:	**assessment**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 6:	**Does the policy require covered facilities to have a SPHM committee?**
Question Type:	Binary - mutually exclusive
Variable Name 6:	**SPHM committee**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 6.1:	**Is the committee required to have a certain portion of non-managerial direct care staff?**

Question Type:	Binary - mutually exclusive
Variable Name 6.1:	**committee makeup**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 6.1.1:	**Is the committee required to be comprised of at least 50% non-managerial direct care staff?**
Question Type:	Binary - mutually exclusive
Variable Name 6.1.1:	**Non-managers**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 7:	**Does the policy compel employers to involve direct care workers in plan and equipment decisions that affect their specific job duties or tasks?**
Question Type:	Binary - mutually exclusive
Variable Name 7:	**Involvement**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 8:	**Does the policy require a written plan to protect workers from SPHM-related injuries?**
Question Type:	Binary - mutually exclusive
Variable Name 8:	**plan**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 9:	**Does the policy require staff training?**
Question Type:	Binary - mutually exclusive
Variable Name 9:	**training**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 9.1:	**Does the policy require periodic re-training?**
Question Type:	Binary - mutually exclusive

Variable Name 9.1:	**retraining**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 9.2:	**Does the policy allow employees to request additional refresher trainings?**
Question Type:	Binary - mutually exclusive
Variable Name 9.2:	**refresher**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 10:	**Does the policy require lift teams?**
Question Type:	Binary - mutually exclusive
Variable Name 10:	**lift teams**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 11:	**Does the policy forbid, to the extent feasible, unaided manual patient handling?**
Question Type:	Binary - mutually exclusive
Variable Name 11:	**equipment mandate**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 12:	**Does the policy require the purchase of SPHM equipment, if deemed necessary in the covered facility?**
Question Type:	Binary - mutually exclusive
Variable Name 12:	**equipment**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 13:	**Does the policy outline the provision of funding for SPHM programs or equipment?**
Question Type:	Binary - mutually exclusive
Variable Name 13:	**funding**

Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 14:	**Does the policy contain requirements for new facility construction or remodeling?**
Question Type:	Binary - mutually exclusive
Variable Name 14:	**construction**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 15:	**Does the policy outline a way for employees to refuse dangerous or improper lifts?**
Question Type:	Binary - mutually exclusive
Variable Name 15:	**refusal**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 15.1:	**Does the policy specifically bar employers from retaliating against employees who refuse dangerous or improper lifts?**
Question Type:	Binary - mutually exclusive
Variable Name 15.1:	**retaliation**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 16:	**Does the policy require the collection of data for program evaluation or reporting purposes?**
Question Type:	Binary - mutually exclusive
Variable Name 16:	**evaluation**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 17:	**Does the policy suggest, recommend, or endorse any Safe Patient Handling safety interventions without legally requiring them?**
Question Type:	Binary - mutually exclusive

Variable Name 17:	**suggestion**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Question 17.1:	**What Safe Patient Handling safety interventions are recommended but not required?**
Question Type:	Categorical - check all that apply
Variable Name 17.1(A):	**recs list_Hazard assessment**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 17.1(B):	**recs list_Written plan**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 17.1(C):	**recs list_Committee**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 17.1(D):	**recs list_Training**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 17.1(E):	**recs list_Lift teams**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 17.1(F):	**recs list_Equipment purchasing or use**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes

Variable Name 17.1(G):	**recs list_Consideration in new facility construction**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 17.1(H):	**recs list_Right to refuse dangerous lifts/protection from retaliation**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 17.1(I):	**recs list_Data collection for program evaluation**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes
Variable Name 17.1(J):	**recs list_Other**
Variable Values:	0, 1
Value Label:	0 = No
Value Label:	1 = Yes

Supplemental Table 2. Full List of SPHM Statutes (Aim 1)

CALIFORNIA

- Labor Code Division 5. Safety in Employment Part 1. Occupational Safety and Health Chapter 3. Responsibilities and Duties of Employers and Employees Cal. Lab. Code § 6403.5 Hospital Patient and Health Care Worker Injury Protection Act

- Title 8. Industrial Relations Division 1. Department of Industrial Relations Chapter 4. Division of Industrial Safety Subchapter 7. General Industry Safety Orders Group 15. Occupational Noise and Ergonomics

    - Article 106. Ergonomics 8 CCR § 5120**.** Health Care Worker Back and Musculoskeletal Injury Prevention.

ILLINOIS

- Title 77. Public Health Chapter I(1). Department of Public Health Subchapter B. Hospitals and Ambulatory Care Facilities Part 250. Hospital Licensing Requirements Subpart I. Nursing Service and Administration Ill. Admin. Code tit. 77, § 250.1030 Policies and Procedures

- Chapter 210. Health Facilities and Regulation

    - Act 45. Nursing Home Care Act Article III. Licensing, Enforcement, Violations, Penalties and Remedies Part 2. General Provisions210 Ill. Comp. Stat. Ann. 45/3-206.05

    - Act 85. Hospital Licensing Act 210 Ill. Comp. Stat. Ann. 85/6.25 Safe patient handling policy

MARYLAND

- Health—General Title 19. Health Care Facilities Subtitle 3. Hospitals and Related Institutions Part X. Safe Patient Lifting Md. Code Ann., Health-Gen. § 19-377 Safe patient lifting committees

MINNESOTA

- Labor, Industry (Ch. 175-189) Chapter 182. Occupational Safety and Health Minn. Stat. Ann. § 182.6551 Citation; safe patient handling act

MISSOURI

- Missouri Code of State Regulations Title 19. Department of Health and Senior Services Division 30. Division of Regulation and Licensure Chapter 20. Hospitals Mo. Code Regs. Ann. tit. 19, § 30-20.097 Safe Patient Handling and Movement in Hospitals

- Repealed: 2019 MO REG TEXT 522666 (NS)

NEW JERSEY

- Title 8. Health Chapter 43E. General Licensure Procedures and Standards Applicable to All Licensed Facilities Subchapter 12. Safe Patient Handling N.J. Admin. Code § 8:43E-12.1-17

- Title 26. Health and Vital Statistics Chapter 2H. Health Care Facilities I. Health Care Facilities Planning Act N.J. Stat. Ann. § 26:2H-14.8-14 Safe Patient Handling Act

NEW YORK

- Public Health Law Chapter 45. Of the Consolidated Laws Article 29-D. Health Information and Quality Improvement Title 1-a. Safe Patient Handling N.Y. Pub. Health Law § 2997-g-l

OHIO

- Title XLI. Labor and Industry Chapter 4121. Industrial Commission; Bureau of Workers' Compensation Ohio Rev. Code Ann. § 4121.48 Long-term care loan fund program

- Repealed: APPROPRIATIONS—WORKERS COMPENSATION BUDGET, 2015 Ohio Laws File 14 (Am. Sub. H.B. 52)

RHODE ISLAND

- Title 23. Health and Safety 23 R.I. Gen. Laws Ann. § 23-17-59 Safe patient handling

- Title 216. Department of Health Chapter 40. Professional Licensing and Facility Regulation Subchapter 10. Facilities Regulation

    - Part 1. Licensing of Nursing Facilities 1.5.1 Safe Resident Handling 216 R.I. Code R. 40-10-1.5

    - Part 2. Licensing Assisted Living Residences 2.4.6 Safe Resident Handling 216 R.I. Code R. 40-10-2.4

    - Part 4. Licensing of Hospitals K. Safe Patient Handling 216 R.I. Code R. 40-10-4.5

    - Part 16. Rehabilitation Hospital Centers 216 R.I. Code R. 40-10-16.10

TEXAS

- Health and Safety Code Title 4. Health Facilities Subtitle B. Licensing of Health Facilities Chapter 256. Safe Patient Handling, Movement, and Discharge

Practices § 256.002. Required Safe Patient Handling and Movement Policy Tex. Health & Safety Code Ann. § 256.002

WASHINGTON

- Title 70. Public Health and Safety Chapter 70.41. Hospital Licensing and Regulation 70.41.390. Safe patient handling Wash. Rev. Code Ann. § 70.41.390

- Title 72. State Institutions Chapter 72.23. Public and Private Facilities for Mentally Ill §72.23.390. Safe patient handling Wash. Rev. Code Ann. § 72.23.390

- Title 246. Department of Health Facility Standards and Licensing Chapter 246-320. Hospital Licensing Regulations Patient Care 246-320-221. Safe patient handling. Wash. Admin. Code 246-320-221

Supplemental Table 3. U.S. Bureau of Labor Statistics musculoskeletal disorder (MSD) definition, by version of Occupational Injury and Illness Classification System (Aim 2)

OIICS Version 1.01*	
Nature title	**Nature code**
Sprains, strains, tears	021
Back pain, hurt back	0972
Soreness, pain, hurt, except back	0973
Carpal tunnel syndrome	1241
Hernia	153
Musculoskeletal system and connective tissues diseases and disorders	17
Event title	**Event code**
Bending, crawling, reaching, twisting	211
Overexertion	22
Repetitive motion	23
OIICS Version 2.01 **	
Nature title	**Nature code**
Pinched nerve	1131
Herniated discs	1211
Meniscus tears	1221
Sprains, strains, tears	123
Hernias due to traumatic incidents	124
Soreness, pain, hurt – nonspecified injury	1972
Numbness – nonspecified injury	1974
Carpal tunnel syndrome	2241
Tarsal tunnel syndrome	2244
Raynaud's syndrome or phenomenon	2371
Hernia – nontraumatic	253
Musculoskeletal system and connective tissue diseases and disorders	27
Event title	**Event code**
Rubbed, abraded, or jarred by vibration	67
Overexertion and bodily reaction, unspecified	70
Overexertion involving outside sources	71
Repetitive motions involving microtasks	72
Other exertions or bodily reactions	73
Multiple types of overexertions and bodily reactions	78

OIICS=Occupational Injury and Illness Classification System

* OIICS version 1.01: MSDs must have a combination of exactly one nature category and exactly one event category from this table. Two- and three-digit categories include subcategories that are not listed separately.

** OIICS version 2.01: MSDs must have a combination of at least one nature category and at least one event category from this table. Two-and three-digit categories include subcategories that are not listed separately.

Supplemental Table 4. Injury category definitions, by version of Occupational Injury and Illness Classification System (Aim 2)

Injury category	Source code	Event code	Nature code
Patient handling injury [broad] OIICS V1.01 OIICS V2.01	 573 574-575	Any	Any
Patient handling injury [narrow] OIICS V1.01 OIICS V2.01	 573 574-575	Event and Nature combinations specified in MSD definition (see Supplemental Table 3)	
Resident violence OIICS V1.01 OIICS V2.01	 573 574-575	 60-63 10-12	Any
Patient handling equipment OIICS V1.01 OIICS V2.01	 344, 372, 775, 779 372, 757, 759, 775, 799	Any	Any
Slips, trips, and falls OIICS V1.01 OIICS V2.01	 Not 573 Not 574-575	 10-13 40-44	Any
Bodily reaction OIICS V1.01 OIICS V2.01	 562 562	 21 73	Any
Exposure to harmful substances OIICS V1.01 OIICS V2.01	 Not 573 Not 574-575	 30-39 50-59	Any

MSD=musculoskeletal disorder; OIICS=Occupational Injury and Illness Classification System; V=version

Supplemental Table 5. Proportions (%s) of workers in Minnesota Healthcare and Social Assistance industry who are involved in "Direct Care" determined by Standard Occupational Classification (SOC) code (Aim 2)

	2012	2013	2014	2015	2016	2017	2018	2019	Mean
Outpatient Care	65.88	66.32	68.24	71.56	73.69	78.55	76.33	74.10	71.83
Home Healthcare	91.19	90.76	92.56	92.37	91.71	90.01	89.1	90.72	91.05
Hospitals (Gen. & Psych. combined)	68.72	67.82	68.63	69.72	71.42	72.29	72.42	72.55	70.45
Skilled Nursing Facilities	71.69	70.89	71.05	73.09	73.42	72.44	71.52	69.02	71.64
Group Homes	89.71	89.60	88.77	88.3	87.43	86.51	86.74	85.40	87.81
Retirement & Assisted Living	76.20	76.78	78.40	79.04	76.33	75.63	73.93	73.16	76.18

Occupations considered to be involved with "Direct Care" work were from the following major SOC groups:

21: Community and Social Service Occupations

29: Healthcare Practitioners and Technical Occupations

31: Healthcare Support Occupations

39: Personal Care and Service Occupations

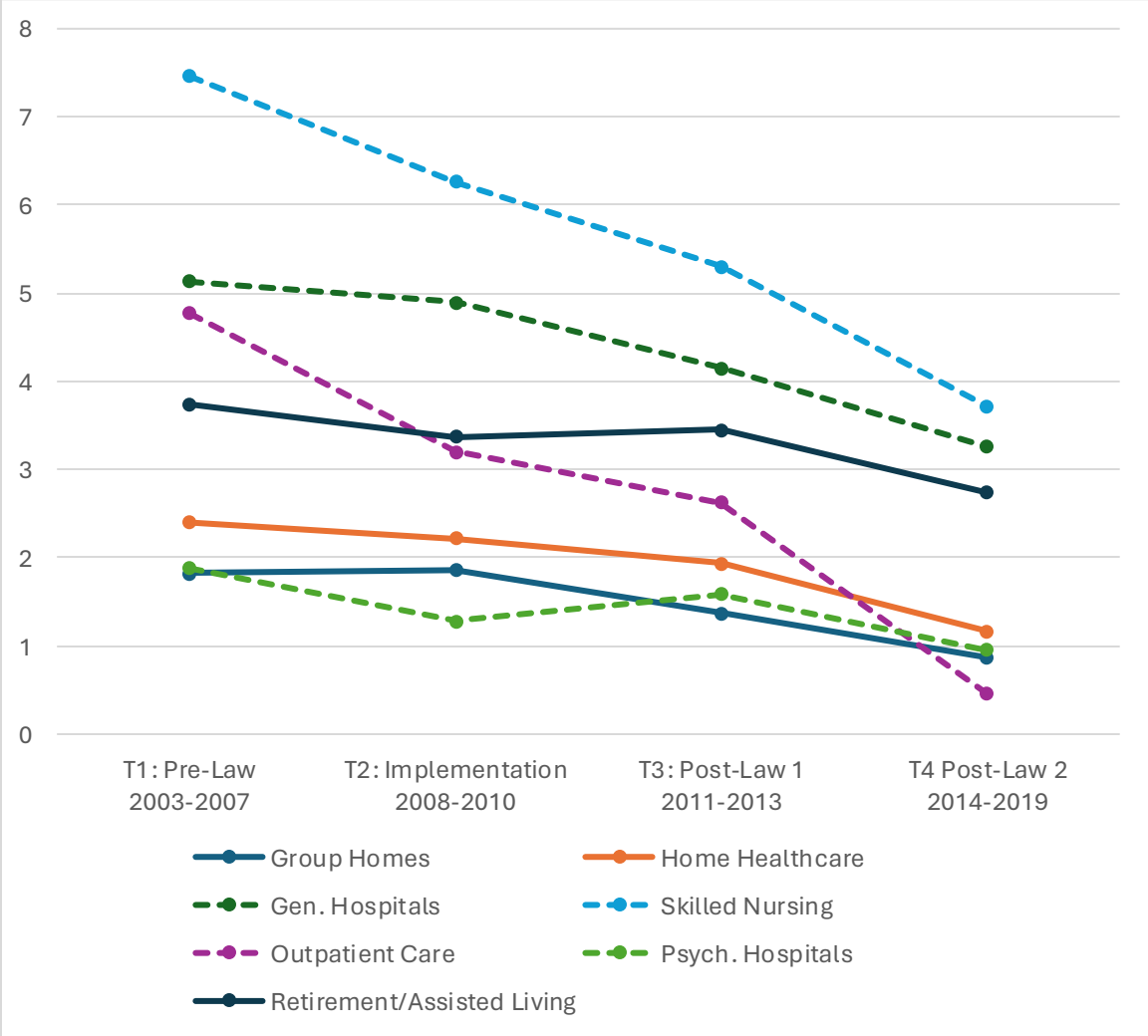
BLS only provides SOC occupational estimates by state and industry at this level of detail during the study years of 2012-2019, therefore those proportions were averaged to calculate the adjustments in the negative binomial offset variable. General and Psychiatric Hospitals were combined due to small employment numbers that were unreported for Psychiatric Hospitals[11].

Supplemental Table 6. Expanded Prevention Indexes, 2014-2019 (Aim 2)

Prevention Index	Industry	Rate Rank	Adj. Rate (per 1000 direct care workers)	Count Rank	Count	Avg. Direct Care Employment (in thousands), 2014-2019
SPHM (Broad)						
1	SNF	2	5.02	2	1,533	36
2	Gen. Hospital	3	4.71	1	2,519	77
3	Psych. Hosptial	1	17.39	6	242	2
4	R/AL	4	4.02	4	532	17
5	Group Home	5	3.53	3	706	28
6	HHC	6	1.68	5	352	25
7	OC	7	0.62	7	32	8
SPHM (Narrow)						
1	SNF	1	3.72	2	1,232	36
2	Gen. Hospital	2	3.26	1	1,880	77
3	R/AL	3	2.74	3	374	17
4	HHC	4	1.17	4	266	25
5	Group Home	6	0.87	5	203	28
6	Psych. Hospital	5	0.95	7	14	2
7	OC	7	0.46	6	25	8
WPV						
1	Group Home	2	2.56	2	496	28
2	Gen. Hospital	3	1.27	1	590	77
3	Psych. Hospital	1	15.55	4	227	2
4	SNF	5	0.90	3	263	36
5	R/AL	4	1.04	5	138	17
6	HHC	6	0.43	6	67	25
7	OC	7	0.07	7	6	8
MSDs						
1	Gen. Hospital	1	5.99	1	3,469	77
2	SNF	2	4.74	2	1,676	36
3	R/AL	3	3.50	3	507	17
4	HHC	5	1.82	4	427	25
5	Psych. Hospital	4	2.42	7	37	2
6	Group Home	6	1.62	5	377	28
7	OC	7	1.04	6	67	8
SNF = Skilled Nursing Facilities, R/AL = Retirement and Assisted Living for the Elderly,						

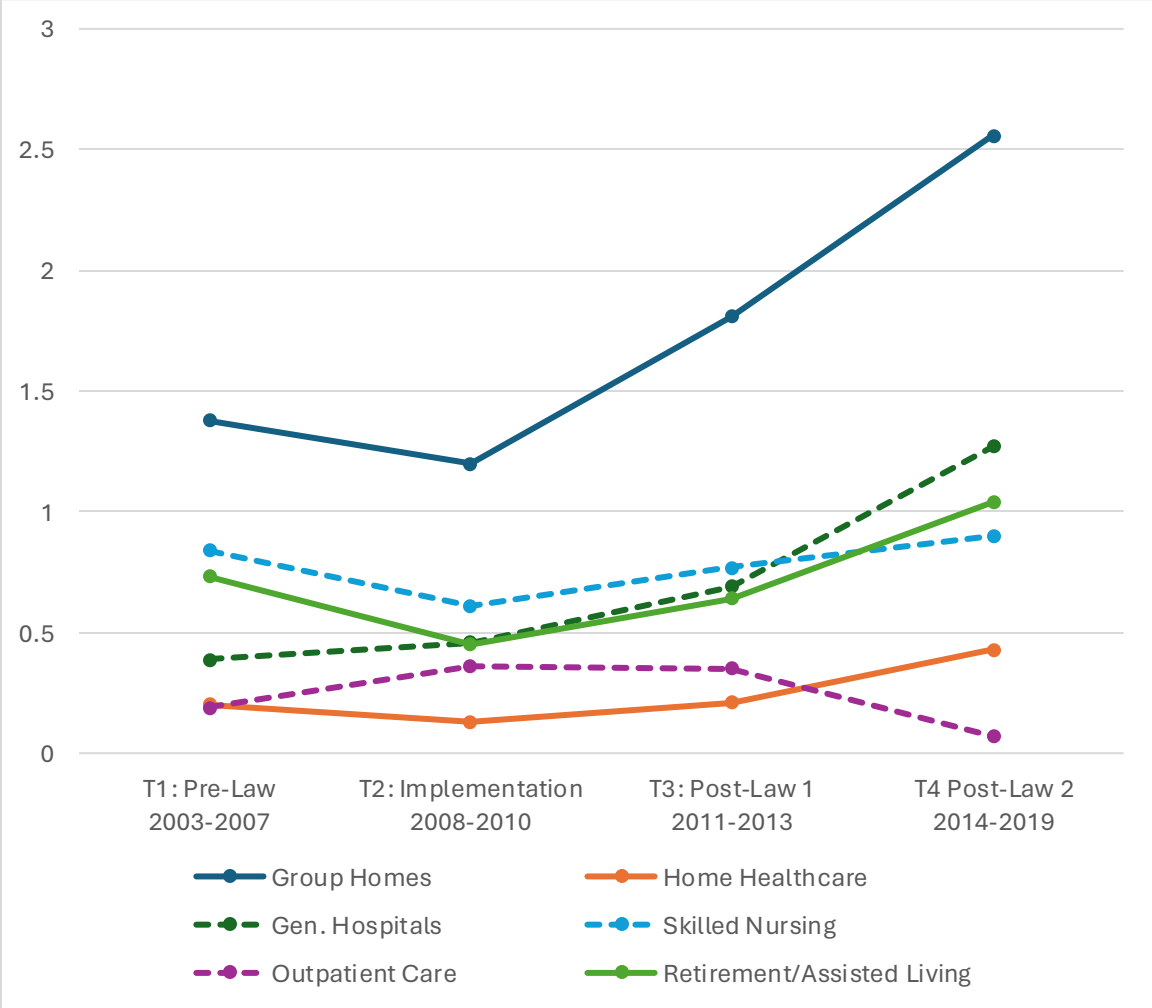
HHC = Home Healthcare, OC = Outpatient Care. “Group Home” is used interchangeable with Residential Intellectual and Developmental Disability, Mental Health, and Substance Use Facilities. Rates adjusted for age group and sex.

Supplemental Figure 1. Rates of Narrowly-Defined SPHM injury per 1,000 direct care workers by industry, 2003-2019 (Aim 2)



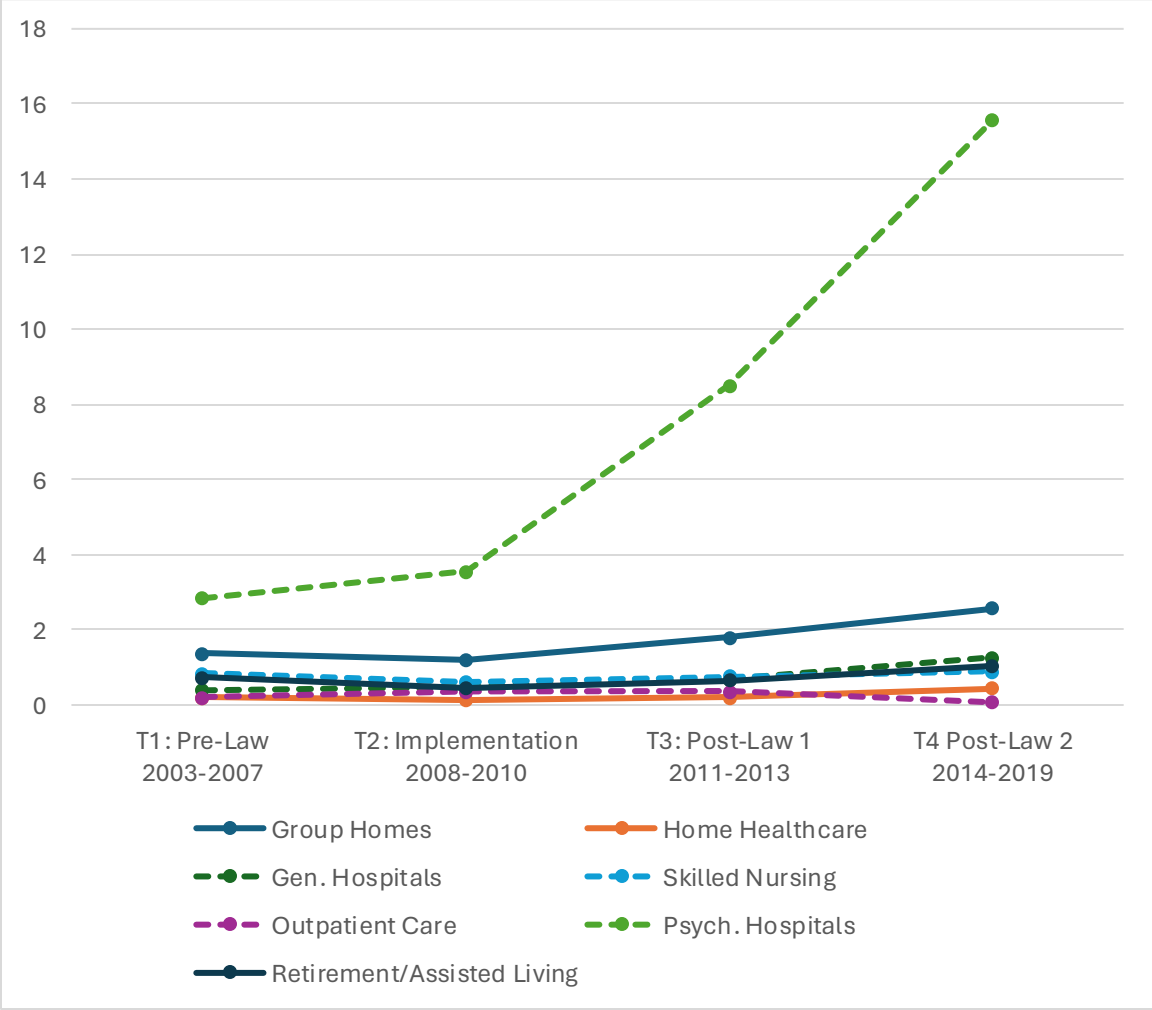
Checked lines denote industries that were covered by the Minnesota Safe Patient Handling Act.

Supplemental Figure 2. Rates of WPV injury per 1,000 direct care workers by industry, 2003-2019, excluding Psychiatric Hospitals (Aim 2)



Checked lines denote industries that were covered by the Minnesota Safe Patient Handling Act.

Supplemental Figure 3. Rates of WPV injury per 1,000 direct care workers by industry, 2003-2019, including Psychiatric Hospitals (Aim 2)



Checked lines denote industries that were covered by the Minnesota Safe Patient Handling Act.

Supplemental Table 7. Minnesota Department of Labor & Industry patient handling and mobility activities (Aim 3)

PATIENT/RESIDENT HANDLING and MOBILITY ACTIVITY
1. Ambulating/walking patient
2. Bathing/diapering/dressing patient in bed
3. Bathing/showering/diapering/dressing patient other than in bed
4. Fall prevention (preventing patient fall) Used patient handling equipment (e.g. lift, assistive/transfer device)
5. Fall recovery (off floor/ground, after fall)
6. Lifting/holding limb/head/stomach/other body part
7. Lifting patient up while on ambulance (hydraulic) gurney/board
8. Making occupied bed
9. Managing uncooperative/aggressive behavior
10. Personal care in bed: feeding, brushing teeth/hair, other
11. Personal care other than in bed: feeding, brushing teeth/hair, other
12. Positioning/removing sling/assistive device
13. Repositioning/moving patient side-to side/up in bed/cot/gurney
14. Repositioning patient in chair/wheelchair
15. Transferring patient to/from toilet
16. Transferring patient in/out of vehicle
17. Transferring patient to/from bed/chair/wheelchair/commode/similar seated items
18. Transferring patient to/from bed/stretcher/trolley/exam table (lateral transfer - from lying position to lying position)
19. Transporting patient in wheelchair
20. Transporting patient by stretcher, gurney, trolley
21. No defined/listed cause Lifting patients all day